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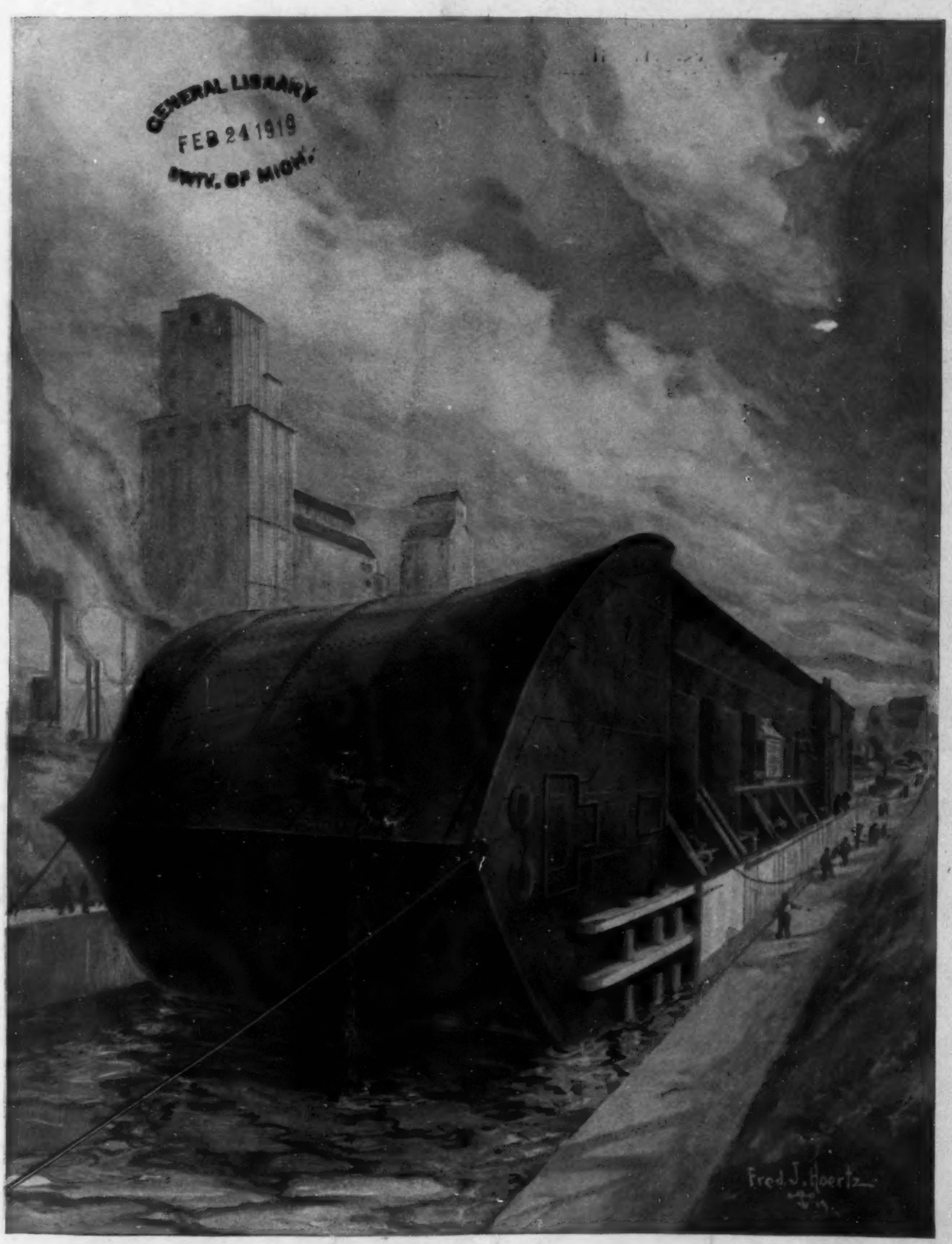

PASSING A 50-FOOT SHIP THROUGH A 44-FOOT CANAL [See page 171]

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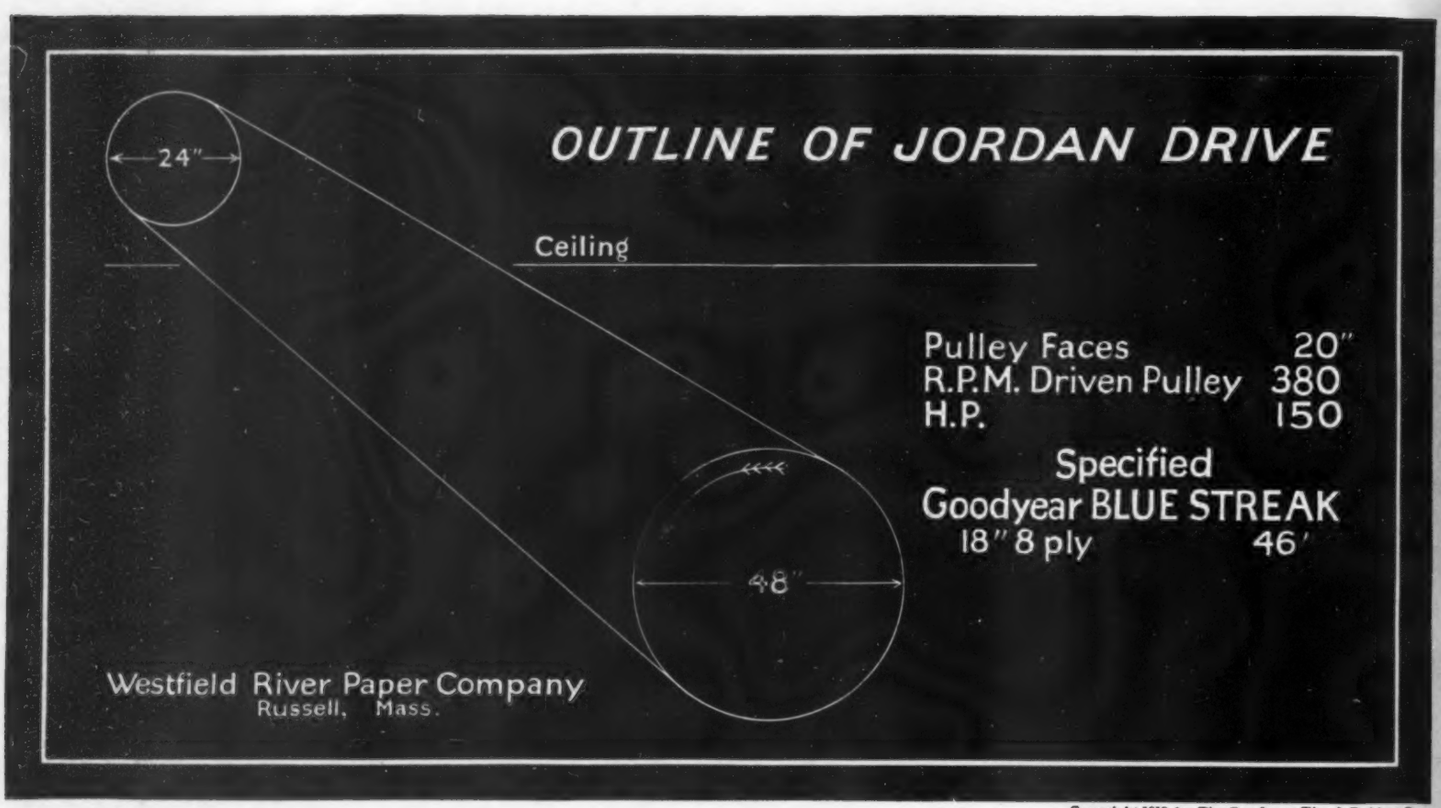


That Extra-Power Jordan—and the G.T.M.'s Extra Ply

Even very good belts had proved to be trouble-peddlers on a certain Jordan. It was in the Westfield River Paper Company's plant at Russell, Mass. Some of the belts pulled out at the fastenings and lacings, all of them stretched, none of them delivered the horsepower needed for that particular Jordan.

One day a G. T. M.—our Mr. Leddy—called on the plant superintendent and explained the Goodyear plan of selling belts according to prescription instead of as a hardware man sells nails. He was asked what he could do for that Jordan drive. He asked to see it—and found that it required 150 horsepower instead of the usual 75 to 100 on Jordans. He asked questions and found that it had been built to do a special amount of hard work that inefficient belts kept it from doing. The G. T. M. made his measurements and started to figure.

He knew that an 18-inch belt ordinarily should not have more than six plies, but in this particular case since the smaller pulley ran at a comparatively slow speed, he saw that he could, with perfect safety, apply an 18-inch 8-ply belt which would do the necessary work. Particularly so, since the Blue Streak Belt possessed the required flexibility to permit the extra ply under the existing conditions.

Mr. Leddy got the order and the belt was applied May 5, 1917. There has not been any trouble on that drive since—although the belt has been working 24 hours every day.

Mr. Dozier, the plant superintendent, says that that belt is delivering more power than any belt he ever had. He thinks that its excellence is largely due to the friction surface that every Blue Streak user knows so well. But he admits that most is due to the G. T. M.—to the prompt and accurate way in which his diagnosis of this troublesome drive was made and the correct remedy figured out. So he has had a G. T. M. make a plant analysis covering every drive in the plant; and he now orders according to its prescriptions whenever an old belt wears out.

If you have a hard drive that makes belts you always thought respectable act like trouble-peddlers, ask a G.T. M. to call. One from the nearest Goodyear Branch will be glad to do so when next he is in your vicinity. His services are free—for the savings he effects for purchasers are so evident and material that a gratifying volume from the plants served is sure to result within a few years.

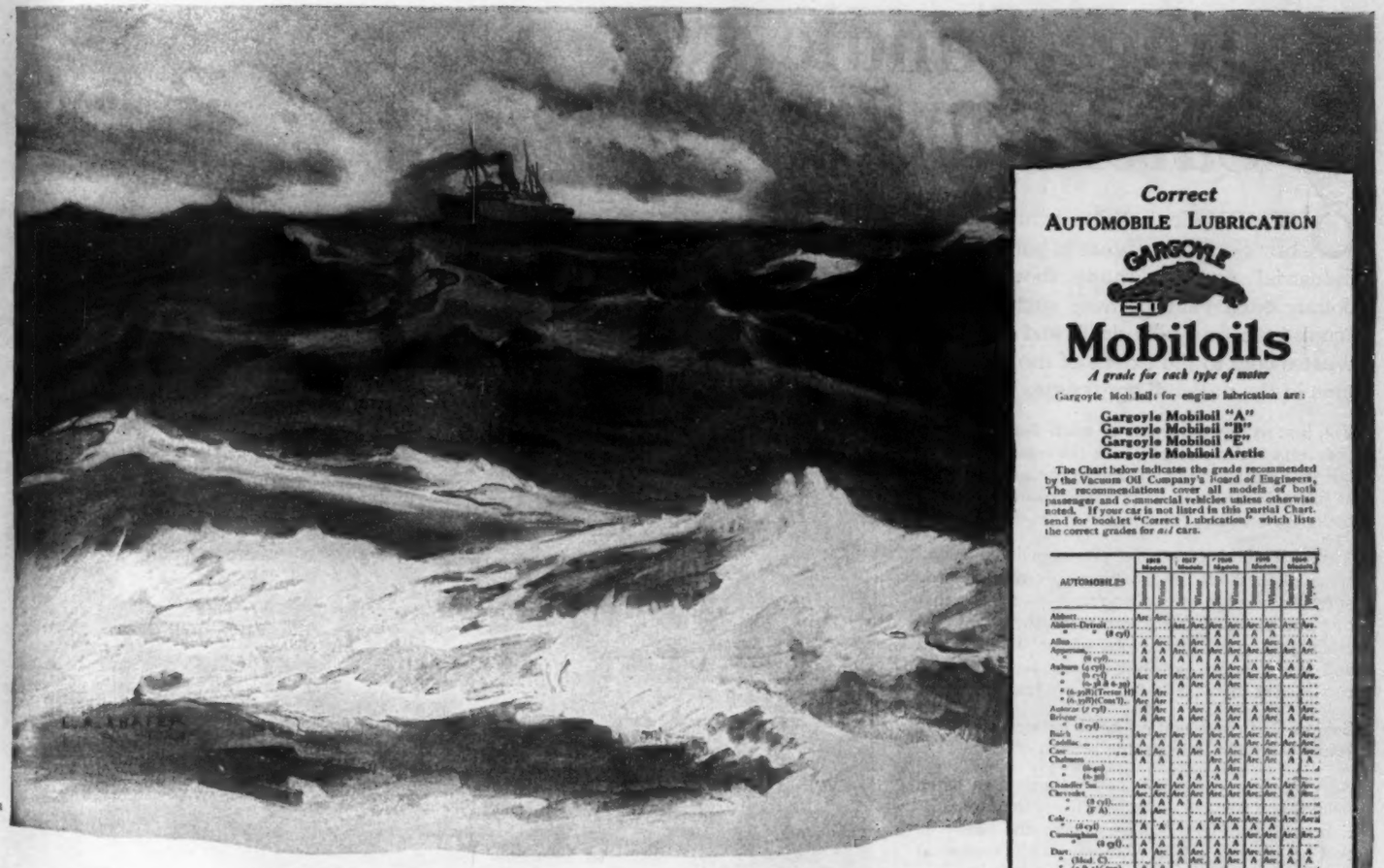
And when the G.T. M. calls ask him about how another G.T.M. —our Mr. DeVerges—saved $347.98 on a single drive, for the Planter's Lumber Company of Jeanerette, La.; and how a G.T.M. —our Mr. Heehs—made $1.00 do the work of $3.00 on a side-head drive in another plant.

THE GOODYEAR TIRE & RUBBER COMPANY
AKRON, OHIO

BELTING · PACKING · HOSE · VALVES

GOODYEAR

AKRON



The Work must go on

TO the needs of an age of machinery are added the needs of the period of reconstruction. Building materials and metal products of all kinds are needed to restore the wastage of war. The rice mills machinery of China stands beside the American tractors in providing food for the world.

For all this machinery correct lubrication must be supplied—that the work may go on.

S. S. OLEAN

The S. S. Olean was built especially to carry oil in barrels. Capacity 14,000 barrels.

S. S. CHAS. M. EVEREST

This ship is named "Chas. M. Everest" after the late president of the Vacuum Oil Company. She carries 8,130 tons of bulk oil.

S. S. GARGOYLE

The purchase of the S. S. Gargoyle marked the end of steamship chartering by the Vacuum Oil Company. The "Gargoyle" is a bulk oil carrier, with a cargo capacity of about 7,000 tons. The work must go on.

S. S. PAULSBORO

The S. S. Paulsboro carries about 11,000 tons. This vessel, which was built in San Francisco, established a new record in shipbuilding. The time consumed from the laying of her keel to the date of delivery was 4 months and 22 days. The work must go on.

GARGOYLE

MOTORSHIP BRAMELL POINT

The Motorship Bramell Point is one of the largest motor driven commercial ships built in the United States. Her launching created a considerable stir in shipping circles. Capacity 5,000 tons. The work must go on.

MOTORSHIP BAYONNE

The Motorship Bayonne carries 1,750 tons of finished oil products, and is used for local service between Paulsboro and Bayonne.

Over the world's water-ways the Gargoyle fleet carries Gargoyle Lubricants to every port of importance in the world.

The Vacuum Oil Company, recognized the world over as leader in scientific lubrication, holds a peculiar responsibility.

The work must go on.

Lubricants

A grade for each type of service

Correct AUTOMOBILE LUBRICATION

GARGOYLE

Mobiloils

A grade for each type of motor

Gargoyle Mobiloils for engine lubrication are:

Gargoyle Mobiloil "A"
Gargoyle Mobiloil "B"
Gargoyle Mobiloil "E"
Gargoyle Mobiloil Arctic

The Chart below indicates the grade recommended by the Vacuum Oil Company's Board of Engineers. The recommendations cover all models of both passenger and commercial vehicles unless otherwise noted. If your car is not listed in this partial Chart, send for booklet "Correct Lubrication" which lists the correct grades for *all* cars.

AUTOMOBILES	1918 Models		1917 Models		1916 Models		1915 Models		1914 Models	
	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter	Summer	Winter
Abbott	Arc	Arc	...	...	...	...	...	...	...	...
Abbott-Detroit	...	...	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	...	...	...	...	A	A	A	A	...	...
Allen	A	Arc	A	Arc	A	Arc	Arc	Arc	A	A
Apperson	A	A	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A	A	A	...	...	...	...
Auburn (4 cyl)	...	...	...	...	...	...	A	A	A	A
" (6 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (6-38 & 6-39)	...	...	A	Arc	A	Arc	...	...	...	...
" (6-39E)(Touring)	A	Arc	...	...	...	...	...	...	...	...
" (6-39E)(Conv't)	Arc	Arc	...	...	...	...	...	...	...	...
Austro-Daimler	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Belgian	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (8 cyl)	...	...	...	...	A	A	...	...	...	...
Buick	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Cadillac	A	A	A	A	A	A	Arc	Arc	Arc	Arc
Case	Arc	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Chalmers	A	A	Arc	Arc	Arc	Arc	Arc	Arc	A	A
" (6-40)	...	...	...	...	A	Arc	...	...	...	...
" (6-30)	...	...	A	A	A	A	...	...	...	...
Chandler Six	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Chevrolet	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc
" (2 cyl)	A	A	A	A	A	A	...	...	...	...
" (F A)	A	Arc	...	...	...	...	...	...	...	...
Cole	A	A	A	A	A	A	Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A	A	A	Arc	Arc	Arc	Arc
Cunningham	A	A	A	A	A	A	A	A	A	A
" (8 cyl)	A	A	A	A	A	A	Arc	Arc	A	A
Dort	A	Arc	A	Arc	A	Arc	Arc	Arc	A	A
" (Mod. C)	...	A	A	A	A	A	A	A	...	...
" (2 ¾ ton)	A	A	...	...	...	...	...	...	...	...
Detroiter	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc	A	A
Dodge Brothers	A	Arc	A	Arc	A	Arc	A	Arc	...	...
Doris	A	A	A	A	A	A	...	...	...	...
Empire (4 cyl)	A	Arc	A	Arc	A	Arc	Arc	Arc	Arc	Arc
" (6 cyl)	Arc	Arc	A	Arc	A	Arc	...	...	...	...
Federal	A	A	Arc	Arc	Arc	Arc	A	Arc	A	Arc
" (Mod. 5-X)	A	A	A	A	...	...	...	...	...	...
" (Special)	Arc	Arc	...	...	...	...	...	...	...	...
Fiat	B	A	B	A	B	A	B	A	B	A
Ford	E	E	E	E	E	E	E	E	E	E
Franklin	A	A	A	A	A	A	A	A	A	Arc
Grant	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Hal-Twelve	...	...	A	A	A	A	...	...	...	...
Haynes	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (12 cyl)	A	A	A	A	A	A	...	...	...	...
Hollier (6 cyl)	A	Arc	A	Arc	...	...	...	...	...	...
" (8 cyl)	A	A	A	A	A	A	A	A	...	...
Hudson	A	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (Super Six)	A	Arc	...	...	...	...	...	...	...	...
Hupmobile	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Jackson	A	A	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	A	A	A	A	A	A	...	...	...	...
Jordan	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Kelly Springfield	A	A	A	A	A	A	A	A	A	A
King	A	A	A	A	A	A	A	A	A	A
" (6 cyl)	A	A	A	A	A	A	A	A	...	...
" (Conv't)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Kissel Kar	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (Mod. 48)	...	...	A	A	A	A	A	A	A	A
" (12 cyl)	A	A	A	A	...	...	...	...	...	...
Lexington	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	...	...
Liberty (Detroit)	Arc	Arc	Arc	Arc	...	...	...	...	...	...
Lippard Stewart	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (Mod. M)	...	...	A	Arc	A	Arc	...	...	...	...
" (Mod. MW)	...	...	A	Arc	A	Arc	...	...	...	...
Locomobile	E	E	E	E	E	E	E	E	E	E
McFarlan	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Madison	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (8 cyl)	...	...	A	A	A	A	A	A	...	...
Marmon	A	A	A	A	A	A	A	Arc	A	Arc
Maxwell	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Mercer	A	A	A	A	A	A	Arc	Arc	A	Arc
" (22-90)	...	...	...	...	...	...	Arc	Arc	...	...
Mitchell	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (8 cyl)	...	...	A	A	A	A	...	...	...	...
Moline-Knight	B	A	A	A	A	A	A	A	A	A
Monroe	A	A	A	A	A	A	A	A	A	A
" (12 cyl)	A	A	A	A	A	A	...	...	...	...
Oakland	A	A	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	...	...	...	...	A	Arc	...	...	...	...
Oldsmobile	A	A	A	A	A	A	A	A	A	A
" (8 cyl)	A	A	A	A	A	A	Arc	Arc	Arc	Arc
Overland	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc	A	Arc
Owen Magnetic	●	●	Arc	Arc	A	Arc	...	...	...	...
" (Mod. M4)	Arc	Arc	...	...	...	...	...	...	...	...
Packard	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (12 cyl)	A	A	A	A	A	A	A	A	...	...
" (Conv't)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Paige (4 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc	A	A
" (6 cyl)	...	...	...	...	A	Arc	A	Arc	...	...
" (6-38)	...	...	...	...	A	Arc	A	Arc	...	...
" (6-38-39)	...	...	A	Arc	...	...	...	...	...	...
" (6-46)	A	Arc	...	...	...	...	...	...	...	...
Paterson	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Pathfinder	...	...	A	A	A	A	Arc	Arc	Arc	Arc
" (12 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Peerless	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
" (8 cyl)	A	A	A	A	A	A	A	A	A	A
Pierce Arrow	A	A	A	A	A	A	Arc	Arc	Arc	Arc
" (Conv't)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Premier	A	A	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Regal	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (8 cyl)	...	...	...	...	A	Arc	A	Arc	A	Arc
Renault (French)	...	...	...	...	A	Arc	A	Arc	A	Arc
Reo	A	Arc	A	Arc	...	...	...	...	...	...
Riker	E	E	E	E	E	E	E	E	E	E
Simplex	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
Solidox	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (¾ ton)	...	...	A	A	A	A	...	...	...	...
Stephens	A	A	A	A	A	A	A	A	A	A
Stearns-Knight	B	A	A	A	B	A	B	A	B	A
" (8 cyl)	B	A	A	A	B	A	...	...	...	...
Studebaker	A	Arc	A	Arc	A	Arc	A	Arc	A	Arc
Stutz	A	Arc	A	A	A	A	A	A	A	A
Velie (4 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	A	Arc	A	Arc
" (6 cyl)	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (2 & 3½ ton)	Arc	Arc	...	...	...	...	...	...	...	...
" (¼ ton)	A	Arc	...	...	...	...	...	...	...	...
Westcott	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
White	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc
" (10 valve)	A	A	A	A	...	...	...	...	...	...
Willys-Knight	B	A	A	A	B	A	B	A	A	A
Willys Six	Arc	Arc	Arc	Arc	...	...	...	...	...	...
Winton	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc	Arc

VACUUM OIL COMPANY *Specialists in the manufacture of high-grade lubricants for every class of machinery. Obtainable everywhere in the world* NEW YORK, U.S.A.

Setting a Candle to Catch a Thief

OUTSIDE air that filters through the brick-enclosing walls of boilers, costs industrial America many thousands of dollars each year because such leakage "cools" the fire, kills draft and therefore wastes coal to the extent of thousands of tons in the national aggregate.

Yet, just as the detection of such leaks is easy (see note under picture), so is the remedy simple; but it is simple largely through the pioneer work of Johns-Manville in its practical contributions to boiler-furnace improvement.

Through a complete line of products listed below, Johns-Manville can assure plants of new standards of heat saving in the boiler-room; standards that met and satisfied the Government during the coal crisis just past, when tons of fuel were saved and many hours of shut-downs averted—at a consequent increase in factory production.

Seldom has conservation been better served by Johns-Manville than in this branch of its service.

And it can be predicted that the products listed below, and the expert knowledge of their application, will be of as great service to the nation in this present period of post-war readjustment as they were during the war.

Because to the progressive plant, conservation has become permanently a national obligation, as well as a business expedient.

H. W. JOHNS-MANVILLE CO.
New York City
10 Factories — Branches in 63 Large Cities

These Johns-Manville Products save fuel in boiler-rooms:

High Temperature (Refractory) *Cements* for boiler settings.
Aerrite Boiler Wall Coating for boiler wall exteriors.
Monolithic Baffle Walls—tight, durable, easy to install; prevent short circuiting of hot gases.
Asbestos Sheets and Blocks for insulating hot surfaces; *Insulating Cements.*
Heat Insulations for steam and hot water piping.
Steam Traps.
Sea Ring Packing—eliminates unnecessary friction between rod or plunger and packing.

JOHNS-MANVILLE SERVICE
COVERS THE CONTINENT

Through—

Asbestos
and its allied products

INSULATION
that keeps the heat where it belongs
CEMENTS
that make boiler walls leak-proof
ROOFINGS
that cut down fire risks
PACKINGS
that save power waste
LININGS
that make brakes safe
FIRE PREVENTION PRODUCTS

A WOODEN frame, over which is fastened a square of cardboard having a small aperture at its center, is pressed against a boiler wall and the edges temporarily but completely sealed by some plastic material.

It is obvious that any leakage in the part of the boiler wall covered by this frame, will immediately be detected by the inrush of air at the small aperture in the center of the cardboard, consequently, a candle flame, held to this aperture will be sucked inward, thus immediately revealing the fact that there is an infiltration of air through the boiler wall, which means fuel waste. By this method an entire boiler wall can be very quickly tested.

This small device was the testing apparatus last year, in hundreds of boiler-rooms, at a time when coal saving was a vital war necessity.

Thousands of tons of coal have been saved by preventing boiler wall leakage and by similar corrective measures at and around the boiler furnace.

A complete service in this department of engineering was one of the important contributions made by Johns-Manville during the fuel crisis.

JOHNS-MANVILLE
Serves in Conservation

SEVENTY-FIFTH YEAR

SCIENTIFIC AMERICAN

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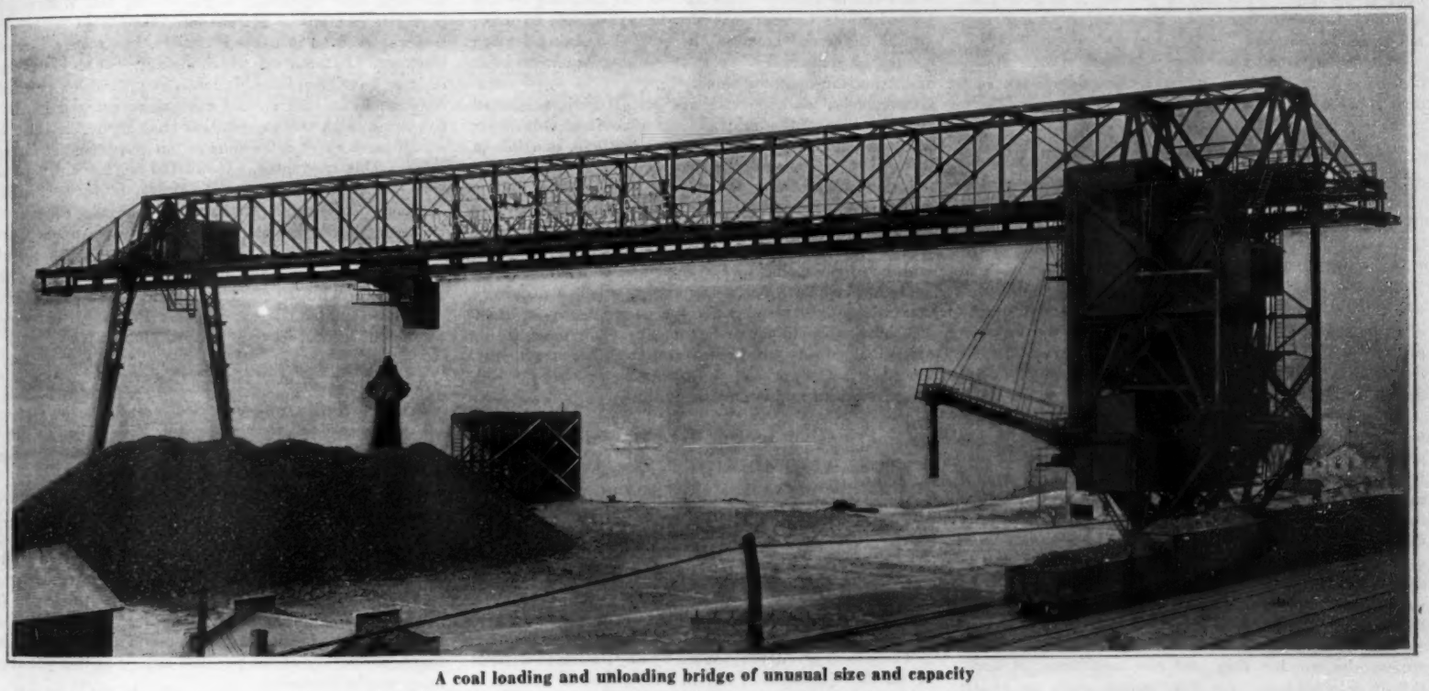

A coal loading and unloading bridge of unusual size and capacity

Huge Bridge to Facilitate Coal Handling

THERE was only one way for the industries to counteract the shortage of labor which has been hitting them so hard during the last few years. That was to discover a mechanical equipment that would take the place of human labor. Almost any inventor who had a scheme that showed signs of being practical had a chance of trial and many devices were brought to light that might otherwise have remained obscure for years.

The large essential industries were, of course, hit the hardest; for the demand from the public was insistent, while the increased demand to supply the armies kept them working at high pressure all the time. This was especially true of the coal mine operators, who seemed to be hampered at every turn. There was shortage of labor in the mine, shortage of labor for loading and unloading and finally a shortage of cars. A coal company at Alicia, Pa., installed a large and costly device which helped in this problem, doing away with a large percentage of the former labor and doing the work in much less time.

From the mine the coal is brought down the Monongahela in barges and by means of this bridge is unloaded either to a storage yard or direct to the cars. The bridge is 355 feet long with a 67-foot cantilever extending out over the river. On the bank at the opposite side of the bridge run the railroad tracks and cars can be run up close under the the structure. At this end of the bridge is the screening equipment so that the coal can be sorted out and shipped in uniform size. The bridge is 110 feet high to the trolley rail making it possible to store coal to a height of 55 feet as compared with 35 to 40 feet, the usual height of a storage pile. This gives a storage capacity of 361 tons per lineal foot of dock.

The hoisting is done by a 6-ton clam-shell bucket with a speed of 250 feet per minute with full load. The trolley travel is 1,000 feet per minute, and the bridge 100 feet per minute. The motor equipment includes a 25-horse-power motor for hoisting, a 50-horse-power motor for trolley travel and a 100-horse-power motor for moving the bridge on its runway.

To facilitate further the loading a tunnel has been built under the storage yard and a railroad track runs into the tunnel. The cars are loaded in this tunnel from the coal piles above through gates, operated by hand from the top of the cars. This increases the loading capacity of the plant as cars can be loaded from underneath while the clam shell bucket operates from above. With this storage space mine operators will not be delayed by a scarcity of cars, while the quick loading and unloading methods will do away with any congestion of cars at the dock waiting to be filled.

Loading and unloading bridges are, of course, by no means a novelty. Something of the sort is to be found at all large mines, and at many shipping and storage points. But the one here described stands almost in a class by itself.

The loading tunnel for railroad cars—an unusual feature of the coal yard

Oil Pipe Line Across Scotland

THE British Government has just completed an eight-inch pipe line across Scotland. It is reported that the line was constructed for the purpose of securing a continuous adequate supply of fuel for the British navy, with a minimum risk of inteference from enemy submarines.

The line follows the course of the Clyde and Forth Canal, the starting point being at Old Kilpatrick, on the outskirts of Glasgow, and the terminal at Grangemouth.

There are two intermediate pumping stations, and it has been estimated that fuel oil can be pumped in a cold state at the rate of 100 tons per hour. At the Old Kilpatrick terminal 16 large tanks have been constructed, each holding 8,000 tons of oil. At the other end the oil is pumped into large reservoirs, easily accessible to oil-burning steamers at Grangemouth and the Forth ports.

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The object of this journal is to record accurately and lucidly the latest scientific, mechanical and industrial news of the day. As a weekly journal, it is in a position to announce interesting developments before they are published elsewhere.

The Editor is glad to have submitted to him timely articles suitable for these columns, especially when such articles are accompanied by photographs.

The Merchant Marine Problem

FOR many years past we have been an earnest advocate of an enlarged merchant marine—a merchant marine that should be commensurate with the great and ever-growing sea-borne trade of the United States. In common with every other advocate of a great shipping fleet, we have realized how complicated was the problem, not so much in respect of building as of operating the ships, and how difficult it would be to awaken in the American people that enthusiasm for the sea which is absolutely necessary if an adequate merchant fleet is to be built and profitably run.

The present revival of interest in our shipping is due to the war, and particularly to the onslaught of the German U-boats. In April, 1917, when shipping was being sunk at a rate approaching one million tons a month, the question of our building ships was no longer one of choice, but of the sternest necessity. Not only did we have to build ships, but we had to build them quickly, and to get a big fleet afloat quickly we had to select such types as lent themselves to the most rapid construction. Furthermore, due to our neglect of shipbuilding, we were without an army of skilled workers and we had to extemporize them. Out of these conditions sprang the wooden ship and our vast army of semi-skilled shipbuilders. For you cannot make an expert shipbuilder offhand. He is a workman whose skill comes only as the result of experience, and, in some branches of the work, of experience spread out over a considerable period of time.

Another compelling element in the problem was the necessity for doing whatever we did on a vast scale. Consequently, quite regardless of cost, we rushed the construction of shipbuilding yards larger than any in existence—too large, as we now know, for permanent economical operation. Furthermore, the Federal Government gave to labor practically whatever wage it asked, with the result that semi-skilled labor in these yards is often receiving pay that is much greater than the income of the average skilled professional man.

Now, as a result of these conditions, we find ourselves with a fleet of ships, large in total tonnage, but very heterogeneous in its make-up. "Beggars can't be choosers," and with the possible loss of the war staring us in the face, we had to commandeer whatever was in sight and build ships that lent themselves to standardised and very rapid construction. Hence our merchant marine includes a whole fleet of wooden ships of limited value. The official figures of the Shipbuilding Board show that the United States now owns steamers of a total of two million gross tons; that we are now building four million gross tons; and that there are two million gross tons owned by private individuals. This means that altogether we have a total of eight million tons gross of shipping, publicly and privately owned and under construction.

But let us be careful, here, not to be misled. The world at large talks in terms of gross tonnage, a gross ton representing very much more than a deadweight ton; and if we wish to have a clear idea of the relative standing of our merchant marine and that of the rest of the world, we must think in terms of gross tonnage. The Department of Commerce of the United States uses gross tons, and since a steamer of 6,000 tons deadweight would be of about 4,000 tons gross, the use of "deadweight tonnage," by the Shipping Board is apt to be very misleading. As a matter of fact, our total of 12 millions in deadweight tons is equivalent to about eight millions in gross tons.

Now, with regard to the future, there is no doubt about our ability to build a great merchant marine. Furthermore, there is no question that, if we pay sufficiently high wages and give the crews sufficiently comfortable quarters, we can adequately man every ship. But when we come to the question of competing with the great outside world, the problem takes on a very different aspect, and, the prosperity of the venture, if it be left entirely to its own unaided devices, becomes very, very doubtful. The only solution appears to lie today, as it did ten or twenty years ago, in the granting by the United States Government of a heavy subsidy to make up the difference between the cost of running foreign competing ships and the cost of running American-built and American-operated ships.

Somebody, we believe it was Mr. Hurley, suggested that we write off the burden of the heavy first cost of our war merchant fleet to the extent of about one billion dollars. Coming on top of Mr. Daniels' request for an addition to our navy which will cost another billion dollars, this proposition of Mr. Hurley will not be very attractive to the already overburdened taxpayer.

If we are determined to have a merchant marine—and the proposal that we carry our own enormous foreign trade in our own American-built bottoms is a decidedly attractive one—there is only one possible way in which the thing can be done, and that is by Congress granting an annual subsidy which will cover the difference in cost, including both overhead and operating expenses, of running American and competing ships.

Protection of Our Foreign Patents

THERE are a good many questions arising out of the war's effect upon patents, patents rights and patent business of one sort or another. Most of these have not been adequately discussed, and for most of them there appears to be no immediate disposition in official quarters to prepare an answer. Not the most prominent, but by no means the least urgent, of these has to do with the filing of applications in one country by citizens of another.

The patent privileges granted by any nation to citizens of another jurisdiction are in every case a matter of reciprocity rather than of legal or moral compulsion. If American citizens were barred from taking out German patents, we should not be willing to issue American patents to Germans; equally, if we were to refuse to grant patents to Japanese, we could not reasonably complain at retaliatory exclusion of American inventors from protection in Japan. The freedom with which patent rights are granted by all civilized countries to foreign citizens is purely a matter of international expediency and agreement. There is no obligation resting upon any nation to treat American inventors upon a "most favored" basis; if we want American inventors so treated, we can only secure that they shall be by extending like treatment.

Today, owing to the war, we have a condition where for months or for years it has been impossible for citizens of certain countries to comply with the ordinary legal conditions laid down for the issue of patents in certain other countries. A German could not file at all in most of his enemy countries; most enemy citizens could not file at all in Germany; the dictates of military expediency prevented in many instances the regular course of application and publication from being followed, so that it was not possible to file in one's own country without performing some act that would forfeit the right of subsequent application in some other country; and so on.

Foreign countries very generally have recognized these conditions and have passed laws relieving inventors of their burdens. In general, these laws have been in the form of extensions on the ordinary statutory time granted to file and prosecute applications, pay fees and taxes, work the patents, etc. But naturally enough, in every case the foreign legislating body, appreciating that international patents are purely a matter of mutual consent, has qualified the concession by adding the condition that it shall only be valid in favor of inventors whose countries have extended substantially equivalent concessions. Thus, England will relieve our inventors of the defaults which would ordinarily have been recorded against them, if we will do as much for hers. But if we tell an Englishman that he can't have an American patent because his Government would not permit him to file his application within the time limit called for by our laws, we cannot expect that Britain will show a great deal of consideration for American inventors who have suffered similarly.

Now if we ask what our Government has done to make such concessions available for American inventors, the astonishing answer will be—practically nothing. To be sure Congress did pass an act extending the time for foreign applicants, but it expired by limitation in January, 1918, and has not been renewed. American and foreign inventors and patent attorneys of highest standing have repeatedly urged action; but Washington is silent. American citizens have benefitted by the extensions granted in other countries, but purely through courtesy. Patents on which default could have been claimed have been issued in foreign countries to American citizens, under the special extensions granted in those countries, with the expectation that sooner or later we would meet these extensions in our treatment of foreign applications filed here. If we fail permanently to do this—if we fail very soon to do it, in fact—it seems eminently reasonable to suppose that the conditional clause in the foreign extension acts will be invoked, and the rights of American inventors attacked. Should this occur, we can for the life of us see no way out for the foreign courts but to declare invalid the patents issued to Americans under the extensions. Probably this would awake our legislators to action—or, would it?

A "Bluff" Navy

IT is perfectly well understood in the halls of Congress and on Newspaper Row that nobody expects Mr. Daniels' second 3-year program to be taken seriously—in other words, this stupendous navy of which we have been hearing lately is a "bluff" navy, intended to be used as a club to drive reluctant or hesitant nations into line for disarmament.

One of the odd elements (we had almost said comic elements) in the situation, is that the Democratic party, who have put forward this preposterous proposal, are by tradition, training, conviction, or any other test that may be applied, thoroughly opposed to any such extravagant outlay of the people's money as this phantom navy would necessitate.

In all fairness to Mr. Daniels it must be admitted that the responsibility for pushing this billion-dollar navy does not lie exclusively on his own shoulders. We have noticed of late that he has stated the President is in sympathy with him; and it must be admitted that what looks like very strong endorsement of Mr. Daniels has come in the form of a cablegram to the House Naval Committee from the President, asking for a unanimous vote in favor of the 3-year program.

There can be no mistaking the meaning of this cablegram. The United States is to invite the nations to disarm under the shadow of 35,000-ton battleships and the threat of 16-inch guns. Why we should rattle the saber at a peace table, where the other delegates are our own Allies, passeth all human understanding.

The American people have been getting news of a sort from Paris; but just how far it agrees with the facts, the censor alone can tell. So far as the course of events has been disclosed, we maintain that absolutely nothing has transpired to change the naval situation as we defined it several weeks ago. Germany, the one naval power that was a threat to the security of the world, has been eliminated, leaving on the high seas only the fleets of nations that are either our friends or actually our allies. In the midst of this amicable situation, we, the United States, professedly the most peaceful nation on earth, suddenly announce that we are going to set out on a scheme of naval expansion, exceeding anything of the kind in the history of the world. We are told that this navy will be built, if it ever is, as a rebuke to the nations of Europe, should they not obediently abolish, or greatly reduce, the fleets which they already possess. Incidentally it will cost us one billion dollars a year thus to play schoolmaster to Europe and is not this billion-dollar rebuke, delivered ahead of the transgression, somewhat premature?

Aeronautical

The Martin Bombing Plane has proved to be a remarkable machine in some of its recent tests. In a flight from Dayton to Cleveland, Pilot Eric Springer and Mechanician Ernest Longchamp drove the plane at an average speed of 172 miles an hour, covering the 215 miles in 1 hour and 15 minutes. The previous record between the two cities was two hours flat. The Martin bomber carries two Liberty engines. In the flight in question the machine carried gasoline, tools and baggage weighing 2,500 pounds.

Aeronautical Exposition.—Both Madison Square Garden and the Sixty-ninth Regiment Armory, New York city, will be required to house the big collection of airplanes to be exhibited by the Manufacturers Aircraft Association at the Aeronautical Exposition late in February and early in March. Sections will be devoted to the Army and Navy machines, as well as to British, French, Italian and German machines. The NC-1, which recently carried 50 passengers, as well as the Caproni and Handley-Page machines, will be shown.

A New Altitude Record.—Contrary to the belief recently expressed in this column, the altitude record of Captain R. W. Schroeder recently made at Dayton, Ohio, did not endure for very long. All altitude records were again broken on January 2d last, when Captain Lang, R. A. F., and Lieutenant Blowers, the former acting as pilot, ascended to 30,500 feet in 66 minutes and 15 seconds. A two-seater biplane fitted with a British-designed and British-built engine, was employed in making this new record. Due to the breaking of his oxygen supply pipe, Lieutenant Blowers collapsed in the course of the upward flight. The pilot in front had no knowledge of the serious condition of his companion, and kept climbing. Having reached 30,500 feet, the engine stopped through lack of fuel, and the pilot began a long volplane. When 10,000 feet altitude was reached, Lieutenant Blowers regained consciousness. Both airmen suffered severely from frostbite.

Airplane Express.—"The important future of aircraft," stated Mr. Glenn L. Martin in a recent talk with press representatives, "is the wonderful commercial application in making accessible by aircraft rich outlying districts tributary to important industrial and business centers. Disastrous delays, such as have been encountered on the railroads, will be obviated, and the speed of delivery by airplane is of course apparent. Coast patrol, forest patrol, and mail carrying will be extensively developed. British Columbia has established a system of aerial forest patrol and the United States is arranging a similar system. The success of the mail route between New York and Washington is known to all. . . . The type of machines adapted and developed for commercial uses will undoubtedly be multiple engined, which will make the possibilities of forced landings remote and will permit travel in all kinds of weather. Instruments to enable airmen to meet adverse weather conditions need development, and their production is vital to ensure the successful use of the airplane to commercial uses."

Self-Starter of the Liberty Engine.—The Liberty self-starter is an air motor and compressor in one. While acting as a starter it runs as a four-cylinder air motor, cranking the airplane engine through a train of gears, inclosed within its transmission. At the end of the transmission is a final drive that connects direct to the crankshaft of the engine. This drive runs continually at engine speed and operates a small pump which furnishes pressure for the petrol feed. After starting the engine the Liberty starter automatically disengages and remains so until needed for further use, either as a starter or compressor. In order to keep an adequate air supply in the tank the starter is engaged as a compressor by pushing a button on the control valve while the airplane engine is running at low speed. When engaged the engine must be speeded up to 1,200 to 1,400 revolutions per minute. At 230 pounds pressure the compressor automatically disengages. The Liberty starter is light, weighing but 30 pounds. It is compact, measuring but eight inches long. It is efficient, cranking the engine at 150 revolutions per minute or more and replenishing its own energy in 30 seconds. It is simple, as there are no pipes leading to the airplane engine, so that it leaves the airplane engine as it should be. The tank weighs 12¼ pounds, making the complete outfit 42¼ pounds.

Science

Proposed Flora of the Philippines.—The Philippine Bureau of Science is planning to start the preparation of a new dictionary of plant names of the Philippine Islands and a critical enumeration of all known species in the islands, with an adjustment of the synonymy, in preparation for the final undertaking, a general flora of the Philippines. It may be possible to combine the Filipino names with the systematic enumeration, thus making a single publication that will include all the technical and local names credited to every plant in the Philippines.

Measurements of Gravity.—The report of the International Geodetic Association, recently published, states that since the last general report on gravity determinations in the Comptes-rendus de la XVII Conférence générale the central office of the Association has received notice of pendulum observations made at about 300 new stations, for 167 of which definite results have been published. The largest number of these determinations have been made in the United States. The total number of stations in the international system of gravity measurements now amounts to 3,200.

Testing of Compasses.—The last annual report of the Bureau of Standards states that little attention has heretofore been paid to the formulation of specifications and the development of methods of testing compasses. The Bureau has recently taken up this matter, in cooperation with the Signal Corps, and has drawn up specifications for airplane compasses and lensatic compasses, besides constructing apparatus for compass testing. Damping liquids for airplane compasses have been investigated, leading to the adoption of kerosene instead of the alcohol and water mixture formerly in use. Studies have also been made on the method of heat treatment and ageing of magnets for compass needles and compensators.

Learning Geography with the Fingers.—The *American Museum Journal* has published an interesting account of the work carried on for the blind by the American Museum of Natural History in New York; especially the arrangements whereby blind children are permitted to handle various objects in the museum, including models, while oral instruction is given concerning these objects. When Admiral Peary gave a lecture at the museum for the blind, flat relief maps were provided showing the Arctic lands and water areas. The auditors were also allowed to handle a number of mounted Eskimo dogs hitched to a sledge. Among the devices for teaching geography are $5 relief globes, each 26 inches in diameter.

A New Process of Coking.—The mystery of why certain kinds of coal yield coke while others do not has never been fully solved. One of the most important industrial problems is that of obtaining coke from the so-called "non-coking" coals, and it is, therefore, highly interesting to learn from the last annual report of the Bureau of Standards that a new process for accomplishing this desideratum has been tested by the Bureau, in conjunction with the Bureau of Mines and the Geological Survey, with results supporting, in general, the claims of the promoters. The details will be awaited with impatience. The new process was tested at Dover, Ohio, by a large corps of Government experts. The test was the most extensive ever conducted on a coke-oven process.

Using Fishes to Combat Malaria.—The last annual report of the Bureau of Fisheries states that the Bureau coöperated with the Public Health Service in the task of protecting soldiers from malaria in one of the large southern cantonments. All available means were used to protect and increase the supply of top minnows (*Gambusia*) in the adjacent waters and careful observations were made on the effectiveness of these and other fishes in the extermination of mosquito larvae. It has been fully demonstrated, says the report, that small fishes are in many cases most effective agents for the control of mosquitoes, but their effectiveness depends upon various conditions, such as the presence of débris and of plants of various species, wave action, fluctuations of level, etc., and definite knowledge is lacking concerning the part played by these factors. Studies on the relation of fish to mosquito larvæ have been carried on jointly by the Bureau of Fisheries and the Bureau of Entomology for the past two years.

Engineering

Raising a 24-inch Water Main.—A 24-inch cast-iron water main was recently raised at Boston to a height of seven feet by means of screw jacks. A piece of land had been purchased for a commercial concern from the City of Boston, subject to easement for two water mains. It was desired to fill the land well above water level, which would bring the grade 11 feet above the top of the pipes. As this would make the pipes inaccessible, it was necessary to raise them seven feet above the previous level. Piles were driven at each side of the pipes and wire slings placed around the pipes were carried up to screw jacks supported on caps fastened across the piles. The water mains were cut at one end but the lifting was done without unscrewing the joints. As the pipe was lifted, the joints adjusted themselves to the new alinement.

The "Medicinal Taste" of Milwaukee's Water Supply.—The City of Milwaukee has been greatly bothered with a peculiar taste in its drinking water. This water is obtained from the lake and is chlorinated before distribution. At first it was thought that the chlorine produced the taste, but a series of tests proved that this was not the source of the contamination. There seemed to be some connection between the intensity of the taste and the direction of the wind, and finally the source of trouble was located in a couple of plants, one three miles away and the other eight miles away, which were producing coal tar products. Quantities of phenol were allowed to escape in the waste, and upon test it was shown that this would produce a noticeable taste, even when diluted to one part of phenol in 500 million parts of water. The taste was aggravated by the chlorination of the water. As yet no method of eliminating the taste has been discovered and efforts are being made to prevent coal distilling plants from throwing their waste into the lake.

Creosoting Wood for Buildings.—In order to preserve timbers and boards used in industrial building, a system of treating them on the site has been provided. In this system pressure is not used to force the creosote into the wood. Open tanks are employed in which a bath of oil is maintained at a temperature between 150 degrees and 200 degrees F. The timbers are immersed in the oil and and then transferred to a second oil bath in which the temperature is not over 100 degrees F. The cooling action of the second bath acts by condensation of the heated air and moisture to assist in causing the atmospheric pressure and capillary attraction to drive the oil into the wood. The periods of immersion in each bath depend upon the thickness and the grain of the wood, the time varying from one hour to 15 minutes per inch of thickness. A second form of treatment consists in spraying the wood or applying the oil with a brush or mop. The process is particularly valuable in buildings in which a high degree of humidity is maintained. The roof timbers of such buildings if untreated are liable to decay in a period of a few years. Treated roof timbers have been found to be in good condition after nine years of service.

Righting a Tilted Intake Crib.—An interesting bit of engineering work was recently done on an intake crib of the Chicago Water Works. In constructing this crib, a caisson was sunk in the lake and after the caisson had been carried down to the proper depth, it was found to be slightly out of alinement. The top was 16 inches out of level. The top was leveled off with concrete and the masonry superstructure was constructed above it. It was then found that the cylinder of masonry was 18 inches out of level and it was necessary to straighten the cylinder. The work was done by blasting out a ring of concrete under the masonry and supporting the latter on jacks. Three hundred jacks were used, which were operated on one side to raise the masonry and on the other side to lower it. The travel of the jacks varied from zero at the neutral axis to a total of nine inches at right angles to this axis. The work was done under the supervision of an observer who sighted upon 24 targets at 15-degree intervals. A corresponding set of targets was marked where they could be observed by the jack foreman and he could check up the figures called by the observer and speed up the jacks or slow them down in accordance with instructions. In this way the cylinder of masonry was rocked back to the vertical position.

Stocking shell blanks. The resettlement of war workers proceeds side by side with the resettlement of the soldiers

This girl is inspecting Mills hand grenades. In this factory 30,000 of these hand grenades were made by women every week

Reconstruction in Europe—III

The British Plan

By C. H. Claudy, Foreign Correspondent of the SCIENTIFIC AMERICAN in London

THERE has been much publication in the United States of stories bringing forth the wonders of the forehandedness of the British Government in considering reconstruction problems long before the necessity for reconstruction became apparent. But such stories have usually proceeded from writers who took into consideration the British facts and looked upon them as silhouetted against an American background.

Had the United States continued in the war for a period of three years there is little doubt that we, too, would have had, if not a Ministry of Reconstruction as has the British Empire, at least a fairly large and very busy bureau of some department working on the problem, or perhaps a Board of the Council of National Defense, concerned only with, "What shall we do after the war?"

As a matter of fact, Britain, with her wholly different and much more complicated problem, while she undoubtedly gave much thought to it from the beginning, did not possess her Ministry of Reconstruction until August, 1917, but little more than a year ago. It has been a short time indeed for such an organization to function to any elaborate end. But in spite of the shortness of the time, the armistice did not catch Great Britain unprepared, and the final settlement of peace will see her with all her theories made and written down, all her plans perfected and all her governmental machinery in the full force of perfect operation—with what result the whole world will wait to see with honest anxiety and high hopes—for her solution of her problem is worthy her high ideals and her courage. Her program deserves to succeed in full measure.

If it does, some credit must certainly be given the machinery. It is, of course, impossible to draw its details in a page—scarcely in a book. But its more important shafts, flywheels, springs and levers can be indicated.

The Ministry of Reconstruction is wholly an advisory department of the government, with no executive powers—much like our own Council of National Defense in that respect. The law creating it defines its powers as being to consider and advise upon the problems which may arise out of the present war and to institute and conduct such inquiries, prepare such schemes and make such recommendations as the Minister of Reconstruction shall think fit. In addition the Minister of Reconstruction may be given authority to act with any government authority, by order in council, of His Majesty.

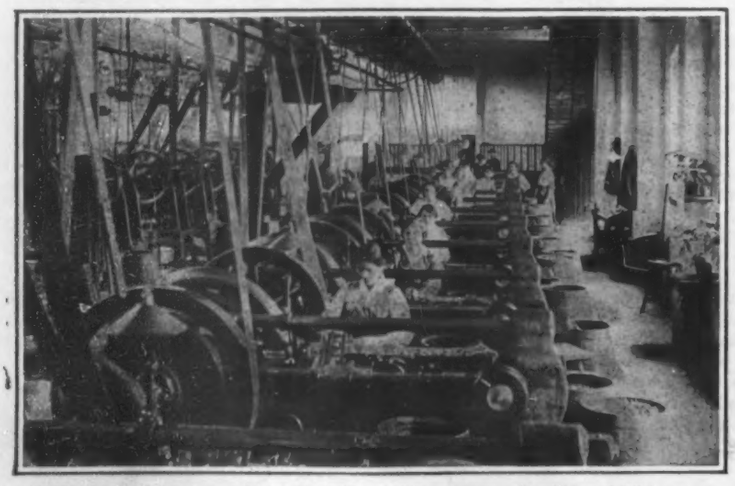
So much for the simple creation of what seems destined to be one of the most vital engines in the British governmental machinery. In getting it in shape to function it has been divided into branches which deal with commerce and production, including the supply of materials, with finance, shipping and public service, with labor and industrial organization, with rural development, with the machinery of both central and local government, including health and education, and with housing and internal transport.

The Ministry as a whole and every branch of it is so arranged as immediately to be notified of any proposal looking to the solution of any post-war problem which may be originated in any department of the government. If any responsible person or organization anywhere in the nation has a scheme or an idea regarding any feature of reconstruction, the Ministry or some particular branch of it is where he or they go. The Ministry as a whole or any branch of it, may initiate any scheme or idea of reconstruction and, if the Minister thinks well of it, investigate it and make a report upon it. The Ministry is, in effect, first a great clearing house of ideas—in a nation as devoted to the purpose of reconstruction in the full meaning of the word as well as to its lesser definitions of reëstablishment and readjustment, this is perhaps its most important function.

Considering all reconstruction ideas, wherever originating, with relation to each other, and with special reference to the branch of government which has executive power in the particular premises, the Ministry builds its reconstruction policy, for submission to the Cabinet, and, if there approved, to Parliament for any necessary legislative action which may be required.

Obviously, this sort of a program is no more a one-man job than a government is a one man job. So the Minister has created an Advisory Council, working in sections, four in number, devoted to production and commercial organization, to finance, transport and public services, to labor and industrial organization and to social development, under which rather all-inclusive heading come such matters as agriculture, education, health, housing, etc.

It is in this council that the true democracy of the reconstruction program has its origin, for each section has representatives of all the principal interests sitting with it. Thus, in the section devoted to finance are not only financiers, but labor interests—in the section which deals with agriculture are not only agricultural interests but business interests represented so that no problem is considered merely from its main, but from all its economic angles.



Battery of indenting machines for .303 cartridge cases under the watchful eyes of their women operatives

When the seven million soldiers return to peaceful pursuits, it is proposed to have all the clothing factories running on a peace basis

The work of the council is sharply differentiated from that of the Ministry as a whole. The former deals with the specific instance only, the latter with the whole subject. The council is well into its labors on many of these specially referred topics, among which are such very diverse, but very important matters as the standardization of railway equipment, post-war rationing of industry, organization of rural information centers, etc.

It is impossible here to go into all the problems which are being considered or which have been considered by the Ministry. Some of them will have a very far reaching effect, not only upon the United Kingdom, but upon the United States. Of some of these, at least, it is hoped to treat at greater length later. For the present, however, many of these activities must be omitted from consideration here on account of lack of space: others can be but sketched.

The munition worker (the girl behind the gun) has been a cornerstone of the National defense. Now she is a national problem. Reconstruction would be an empty word if the Empire forgot these loyal girls

In the branch dealing with commerce and production, for instance, the supply and control of raw materials for post-war industry is a very vital matter. So is the subject of financial facility for British commerce and industry. Many industries in England are in danger of total extinction, though vitally needed, because of failure of supplies or material or even of labor. It is a problem in which the priority organization of the government is directly interested and is considered by the Ministry of Reconstruction in connection with that department. Similarly is the matter of the establishment of new industries a matter of great moment, and here America may find herself more than an interested spectator, for the committee appointed to consider this has already made a report showing what new industries can be and what should be established and many of them, especially as regards those which may be called engineering trades in England, but which we know as manufacturing businesses in the United States, affect American export probabilities in no small degree. Volume of demand for British goods, the nature of that demand, and how best to create a larger amount is getting serious attention, and, to help fill the demand, investigations into improvements in trade organizations to a better and more economical production, distribution and marketing, are being conducted in the most practical and go-ahead way.

Great Britain is not asleep. She recognizes that there is to be a tremendous world demand for manufactured goods. The world is in many ways four years behind on normal output, and the devasted regions present a gaping hole which must be filled. It is the history of all wars that they are followed by a period of uncertainty, of readjustment, which speedily merges into feverish business and manufacturing activity. This war should be no exception, and Great Britain proposes to get her share and to help rebuild her shattered industries — industries shattered by a patriotic devotion to cause and country — by understanding not only the demand but the best way to meet it.

Another labor of the Ministry is in connection with the disposal of government stores. It sounds simple enough to say, "store them" and it is equally simple to say, "sell them," but neither answer at all fits the emergency. Great Britain was preparing, right up to the 11th of November, for a war of unstated length. So was the United States. But we had just begun to function and Great Britain's manufacturing machinery had been speeding up through four years. Her industries were organized entirely on a war basis—ours on a peace basis with war outcroppings! She has immense, stupendous amounts of material made and ready for service. To store it is to mulct the taxpayer of money both he and the government need for other things. To dump all these stores upon the market may be to ruin some industries and cause a labor riot of no mean proportions. For instance, there are literally thousands of motor lorries in perfectly good running order. What shall be done with them? If they are sold, what becomes of the great motor industry, now ready to resume its activities? What becomes of the men who want to reëngage in such industries, who have been perhaps, sustained through years of trench toil and bloody sacrifice by the thought of the work-bench, the job, the wages waiting for them, promised to them both by their employers and by the government for which they went forth to battle? Yet, to store all these vehicles and make the state pay is to make the individual pay—and the individual in the Empire is already paying and paying well for this war! One proposition is to absorb them gradually into agricultural transport or public service, but the question requires considerable thinking out and much planning —it is one of the practial things for which the Ministry of Reconstruction was created.

There are hundreds of such problems and problems within problems. All are being considered with reference not only to reëstablishment of pre-war conditions, but with relation to the betterment of industry, commerce, manufacturing, the individual, the laborer, the municipality, the woman, the child — with reference to the remoulding of the nation on better, more humane, more economic and more progressive lines. And they are being considered to some effect and with results already apparent, because of the Ministry of Reconstruction, which collects, coördinates and makes practical the combined reconstruction brains of the whole government—indeed, of the whole nation.

A Norwegian City Created by the War

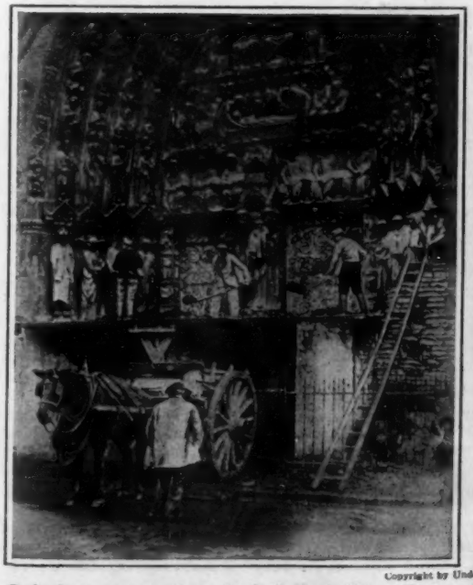
As has been the case in most countries the efforts which industry has made in Norway to help itself and become independent of foreign markets have had great results. The enormous power in the hundreds of Norwegian waterfalls has been of invaluable importance.

One of the main centers of this great industrial revolution is the district around "Sognefjorden," with its 100-mile water basin. None of the Norwegian fjords has such enormous water power as this one, and so, in recent years, one factory after another has been built there. The foremost of these is the enormous plant built by Norsk Aluminum Company, with the Hoyang Falls as source of power. During the past two years a new Norwegian industrial city has been built there, with many factories and good and satisfactory dwellings for the employees. When peace comes this will be an interesting link in the chain of Norway's tourist attractions. When all these plants are running normally they will be Europe's largest aluminum producers.

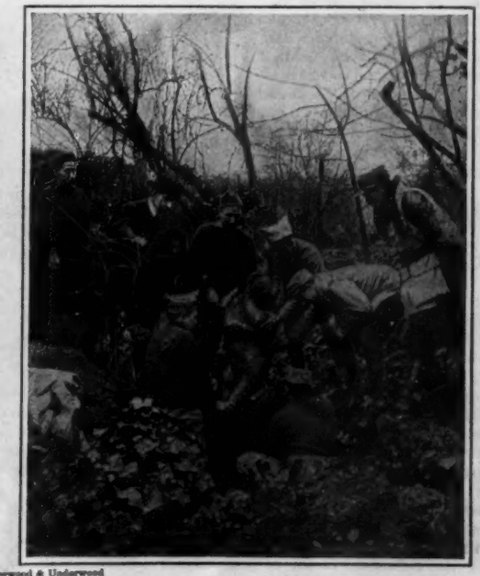
Restoring the Art Treasures of France

It was clearly evident at the very outset of the war that the barbarian hordes which swept into France, had no true conception of the beauties of art. There could be no plea of efficiency to justify them in the wanton destruction of rare paintings and precious sculptures. Certainly such acts were not calculated to intimidate the French people but rather to exasperate them. Cathedrals seemed to be a special mark for German gunners and airplane bombers. To protect the richly carved entrances of these edifices, the French masked them with walls of sandbags. The work of removing these protecting coverings was started soon after the signing of the armistice. One of the accompanying photographs shows the work of restoring the principal porch of the Cathedral of Notre Dame, in Paris, which for years has been hidden behind a mass of earth and sand.

Our other photograph illustrates the disinterring of one of Rodin's masterpieces at Douai. This was discovered by French soldiers while hunting for hidden mines. It was not buried by the French, but by some German officer who took a fancy to the figure and concealed it with the purpose of digging it up and sending it back home when opportunity offered. It offers another bit of evidence of the systematic despoiling and looting of art treasures by German officers.



Stripping war armor from the Cathedral of Notre Dame



Disinterring a statue buried by the Germans at Douai

The Principles of Camouflage—III

The Visibility of Airplanes

By M. Luckiesh

IN the Great War the airplane made its debut in warfare and in a short time made a wonderful record; still when hostilities ceased aerial camouflage had not been put on a scientific basis. No nation had developed this general aspect of camouflage systematically or to an extent comparable with the developments on land and sea. The chief reason was that scientific data which were applicable were lacking and, furthermore, in some quarters there appeared to be unwarranted prejudice against striving for low visibility of aircraft. Just before the close of the war the writer completed an extensive investigation of the fundamentals upon which the attainment of low visibility for airplanes must be based. Solutions of the problems encountered in rendering airplanes of low visibility resulted and various recommendations were made. The experiences and data will be drawn upon only in a general way, but it is hoped that details and interesting byproducts of the investigation can be presented at a later date. In this general review such details would consume too much space for the intention has been to present a broad and concise view of the subject of camouflage.

The visibility of airplanes presents some of the most interesting problems to be found in the development of the scientific basis for camouflage and many novel and thrilling experiences attended the accumulation of the requisite data. The general problem may be subdivided according to the type of airplane, its field of operation, and its activity. For example patrol craft which fly low over our own lines would primarily be camouflaged for low visibility as viewed by enemies above. High-flying craft would be rendered of low visibility as viewed primarily by the enemy below. Airplanes for night use present other problems and the visibility of seaplanes is a distinct problem owing to the fact that the important background is the water because seaplanes are not ordinarily high-flying craft. In all these considerations it will be noted that the activity of the airplane is of primary importance because it determines the line of procedure in rendering the craft of low visibility. This aspect is too complicated to discuss thoroughly in this article.

Viewing Aircraft from Above

The same fundamentals of light, color and vision apply in this field as in other fields of camouflage but different data are required. When viewing aircraft from above, the earth is the background of most importance. Cumulus clouds on sunny days are generally at altitudes of 4,000 to 6,000 feet. Clouds are not always present and besides they are of such a different order of brightness from that of the earth that they cannot be considered in camouflage designed for low visibility from above. In other words the compromise in this case is to accept the earth as a background and to work on this basis. We are confronted with seasonal changes of landscape, but inasmuch as the summer landscape is of greatest importance generally, it must be the dominating factor in considering low visibility from above.

On looking down upon the earth one is impressed with the definite types of areas such as cultivated fields, woods, barren land and water. Different landscapes contain these areas in various proportions which fact must be considered. Many thousand determinations of reflection factor and approximate color were made for these types of areas and upon the mean values camouflage for low visibility as viewed from above was developed.

Wooded areas are the darkest general areas in a landscape and possess a very low reflection factor. From above one sees the deep shadows interspersed among the highlights. These shadows and the trapping of light are largely responsible for the low brightness or apparent reflection factor. This is best illustrated by means of black velvet. If a piece of cardboard is dyed with the same black dye it will diffusely reflect 2 or 3 per cent of the incident light, but the black velvet will reflect no more than 0.5 per cent. The velvet fibers provide many light traps and cast many shadows which reduce the relative brightness or reflection factor far below that of the flat cardboard. Cultivated fields on which there are growing crops are nearly twice as bright as wooded areas, depending of course upon the denseness of the vegetation. Barren sunbaked lands are generally the brightest large areas in a landscape, the brightness depending upon the character of the soil; wet soil is darker than dry soil, owing to the fact that the pores are filled with water thus reducing the reflection factor of the small particles of soil. A dry blotting paper which reflects 75 per cent of the incident light will reflect only about 55 per cent when wet.

Inland waters which contain much suspended matter are about as bright as grazing land and cultivated fields. Shallow water partakes somewhat of the color and brightness of the bed and deep ocean water is about as dark as wooded areas. Quiet stagnant pools or small lakes are sometimes exceedingly dark owing to the fact that their brightness as viewed vertically is almost entirely due to surface reflection. If it is due entirely to reflection at the surface, the brightness will be about 2 per cent of the brightness of the zenith sky. That is, when viewing such a body of water vertically one sees an image of the zenith sky, reduced in brightness to about 2 per cent. Mean values for all of these have been established by actual measurements.

Earth Patterns

The camouflage which has been applied to airplanes for the purpose of obtaining low visibility as viewed from above has not been founded upon systematic experiments as can be seen by the patterns used. The earth patterns were extensively studied in this investigation and concrete solutions have been recommended. Although it is out of the question to present a detailed discussion of this important phase at this time attention will be called to the manner in which the earth patterns diminish with increasing altitude.

For simplicity assume a camera lens to have a focal length, equal to 10 inches, then the length x of the image of an object 100 feet long will be related to the altitude h in this manner:

$$\frac{x}{10} = \frac{100}{h}, \text{ or } x\,h = 1000$$

HOSTILITIES came to a close before the art of camouflage had been extended to the protection of aircraft, but studies of the problem had been made and these are outlined in the present article by Mr. Luckiesh. This is the last instalment of the series. The first, appearing in the SCIENTIFIC AMERICAN *of January 25, 1919, dealt with the art of concealment and deception as practised on land, and the second, in our issue of February 8, with low visibility and optical illusion on the sea.*—EDITOR.

It is seen that this is the equation of a hyperbola. By substituting the values of altitude h in the equation the values of the length x of the image are found. It is easier for some to visualize this relation by means of a plotted curve, but the following values will illustrate the change in size of the image with altitude.

Altitude, h	Size of image, x
1,000 feet	1.00 inches
2,000 feet	.50 inches
3,000 feet	.33 inches
4,000 feet	.25 inches
10,000 feet	.10 inches
20,000 feet	05 inches

It is seen that the image diminishes less rapidly in size as the altitude increases. For example going from 1,000 feet to 2,000 feet the image is reduced to one half. The same reduction takes place in ascending from 10,000 to 20,000 feet. By taking a series of photographs and knowing the reduction factor of the lens it is a simple matter to study pattern. An airplane of known dimensions can be placed in the imagination at any altitude on a photograph taken at a known altitude and the futility of certain patterns is at once evident.

Earth Haze and Cloud Haze

It is out of the question to present colored illustrations in this article and values expressed in numbers are meaningless to most persons so a few general remarks will be made in closing the discussion of low visibility as viewed from above. A black craft is of much lower visibility than a white one. White should never be used. The paints should be very dark shades. The hues are approximately the same for the earth areas as seen from the earth's surface. Inland waters are a dirty blue-green or bluish green, and deep ocean water is a greenish blue when viewed vertically or nearly so.

Before considering other aspects of camouflage it is well to consider some other features such as haze, clouds and sky. There appear to be two kinds of haze which the writer has arbitrarily called earth haze and cloud haze, respectively. The former consists chiefly of dust and dirt and smoke and usually extends to an altitude of about one mile although occasionally it extends much higher. Its upper limit is very distinct as seen by the "false" horizon. This horizon is used more when flying high than the true horizon. Out of the top of this haze cumulus clouds are commonly seen to be poking out like nearly submerged icebergs. The "cloud" haze appears somewhat whiter in color and appears to extend sometimes to altitudes of several or even many miles. The fact that the "earth" haze may be seen to end at 6,000 feet and the "cloud" haze to persist even at 20,000 feet has led the writer to apply different names for convenience. Haze aids in lowering the visibility of airplanes by providing a luminous veil, but it also operates at some altitudes to increase the visibility of airplanes viewed from below by tending to increase the brightness of the sky which is the background in this case.

The sky generally decreases considerably in brightness as the observer ascends. The brightness of the sky is due to scattered light, that is, to light being reflected by particles of dust, smoke, thinly diffused clouds, etc. By making a series of measurements of the brightness of the zenith sky for various altitudes, the altitude where the earth haze ends is usually plainly distinguishable. In some extreme cases the sky was found to be only one-tenth as bright at high altitudes as at low altitudes. This accounts partly for the decrease in the visibility of an airplane as it ascends.

Airplanes Viewed from Below

Doubtless it has been commonly noted that airplanes are generally very dark objects as viewed from below against the sky. Even when painted white they are much darker than the sky. As they ascend the sky above them becomes darker although to the observer on the ground the sky remains constant in brightness. However, in ascending the airplane is leaving below it more and more luminous haze which acts as a veil in aiding to screen it, until when it reaches a high altitude the combination of dark sky behind it and luminous haze between it and the observer on the ground renders it of low visibility. Another factor which contributes somewhat is its diminishing size as viewed from a fixed position at the earth. The minimum perceptible contrast becomes larger as the size of the contrasting patch diminishes.

Inasmuch as there is not enough light reflected upward from the earth to illuminate the lower side of an opaque surface sufficiently to make its brightness comparable with the brightness of the sky it is necessary, in order to attain low visibility for airplanes as viewed from below, to supply some additional illumination. Computations have shown that artificial lighting is impracticable, but measurements on airplane fabrics indicate that on sunny days a sufficient brightness can be obtained from direct sunlight diffused by the fabric to increase the brightness to the order of magnitude of the brightness of the sky. On overcast days an airplane will always appear much darker than the sky unless artificially illuminated. That is, the brightness of the lower sides can in no other manner be made equal to that of the sky. However, low visibility can be obtained on sunny days which is an advantage over high visibility at all times as is the case with airplanes now in use. Many observations and computations of these and other factors have been made so that it is possible to compute and predict results. Transparent media have obvious advantages, but also disadvantages.

Having considered low visibility of aircraft as viewed from above and from below, respectively, it is of interest to discuss briefly the possibility of attaining these with a given airplane. Frankly it is not practicable to do this. An airplane to be of low visibility against the earth background must be painted or dyed very dark shades of appropriate color and pattern. This renders it almost opaque and it will be a very dark object when viewed against the sky. If the lower surfaces of the airplane be covered with white paint or aluminum foil the airplane still remains a dark object against blue sky and a very dark object against an overcast sky, except at high altitudes. In the latter cases the contrast is not as great as already explained. The only practicable method of

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The German Art of Make Believe

How Germany Got Along With Various Substitutes During Her Prolonged Isolation

PRIOR to the war by far the greater portion of raw stuffs required by Germany were imported from abroad (in round figures valued at about 10,000,000,000 marks). The blockade practically shut down foreign imports. It is thus natural that the question of substitute materials became the absorbing one in Germany. Official, industrial, and scientific Germany applied its utmost energy in attempting to solve it. The question was not only to take care of the pressing war requirements but also the difficulties that might arise if the country had to become permanently economically independent.

The principal efforts were made in the fiber and thread industry. The most interesting inventions in the field of textile substitutes are those procured from burning nettles, and it is believed that a most valuable substitute for cotton has been found. A company was founded to investigate and encourage the use and production of nettle fiber. As the demand and production increased, this company was soon obliged to absorb the earlier and smaller concern devoted to this work.

Instead of the former process of steeping, an engineer invented a new chemical process for the extraction of the glutinous matter of the plant fiber, which, according to the opinion of experts, is of the highest value. In the cultivation of burring nettles great progress has likewise been made. The present company is planting great quantities of nettles on previously untilled lands, especially low lands, and forming regular plantations. Thus the basin of the former Teltover Sea is now being planted with nettles and according to the most favorable methods. Nettles are likewise being planted as if they were in their wild or natural state, and in the shade as well as in the sun, experiment having shown that the plants thrived in both.

They are further being planted in alder woods and in regular farm fields, the latter having previously been believed scientifically impossible. Thousands of acres have been cultivated in the Friesack, Stettin, and Celle districts. The nettle needs but little care and fertilizing, but water at least 15 meters (about 50 feet) below the surface. Specialists place particular importance upon the fact that their cultivation really improves the soil. The nettles are also perennials, and the same field can be cultivated with them for five years running.

Spinning of nettle fiber has been known for years. The old Egyptians were familiar with it, and the Germans have long known it. In modern times, however, it did not seem practical, owing to the difficulty encountered in separating the fiber from the stems. The chemical separation of the fiber from the stem made the whole thing both possible and important to large scale production.

While nettle fiber has proved a valuable substitute for cotton, so has the stem of rushes (Typha) proved to contain valuable substitutes for hemp and jute. Up to now no practical use has been found for typha—it has merely been considered a useless wild-growing pond grass. According to the German press, typha has now been found to be of the greatest value and service, and it is proposed to cultivate it extensively in the future. It is believed that it will also prove of considerable economic value after the war. Special harvesters are being constructed which it is expected will reap the rushes with greater facility than has been possible up to the present.

Peat fiber belongs to the most interesting discoveries in the field of substitute textile raw stuffs. This cannot, however, be practically used without mixture with other kinds of fiber. A mixture of 50 per cent peat fiber and 50 per cent wool gives, according to the opinion of German experts, a very strong and durable material that looks extremely well and is excellent for men's clothing. The valuable qualities of peat fiber, however, are limited by the difficulties in procuring the peat. Only the younger moss turf called "Grantorf," contains some eight per cent of the "curls" which can be employed in spinning. The black peat (used for burning) can not be employed. The production from about 5,000,000 double hundredweight of peat amounts to about 100,000 double hundredweight of fiber; in other words, a very small amount, when the labor and the actual yield are both taken into account.

The textile industry has also done its best in order to find a substitute for the leather which is required in constantly increasing degree. A German textile company has succeeded in finding a perfect substitute for "uppers," which will also in times of peace prove most valuable.

Not only in the textile industry but also in other fields German ingenuity has been busily occupied in its attempt to find substitutes. Special interest was thus directed toward the production of artificial rubber, a question which has been technically solved in times of peace. Artificial rubber was produced prior to the war, but was shortly given up owing to the fact that cultivated rubber fell in price from 30 to four marks per kilo (2.2 pounds). When the scarcity of rubber again arose with the war, the production of synthetic rubber was again considered. Substitutes, however, had to be discovered owing to the lack of raw stuffs—aceton and aluminum. When it was found possible to produce aceton from coal and carbide and to produce aluminum on a large scale, the production of artificial rubber could be undertaken. But the synthetic rubber is evidently merely fitted to a war need, for it can not compete with the genuine article. Added to this, its cost is much higher than London quotations for genuine rubber.

Endless energy was also expended in the field of foodstuffs. The question of employing lupine as a foodstuff on a large scale was studied. A large company with a capital of 3,000,000 marks was founded for this purpose in Chemnitz.

The food values contained in lupine, however, can only prove serviceable when the bitter acid, which makes the lupine fruit entirely unpalatable, has been removed. The flour which is produced tastes good, is very nutritious

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Correspondence

The editors are not responsible for statements made in the correspondence column. Anonymous communications cannot be considered, but the names of correspondents will be withheld when so desired.

The Associated Mountaineering Clubs

To the Editor of the SCIENTIFIC AMERICAN:

In 1916, nine clubs and societies with common aims associated themselves in a Bureau, with headquarters in New York. The membership now numbers 22, comprising over 20,000 individual members, as follows:

American Alpine Club, Philadelphia and New York.
American Game Protective Association, New York.
American Museum of Natural History, New York.
Adirondack Camp and Trail Club, Lake Placid, N. Y.
Appalachian Mountain Club, Boston and New York.
Boone and Crockett Club, New York.
British Columbia Mountaineering Club, Vancouver.
Colorado Mountain Club, Denver.
Field and Forest Club, Boston.
Fresh Air Club, New York.
Geographic Society of Chicago.
Geographical Society of Philadelphia.
Green Mountain Club, Rutland, Vt.
Hawaiian Trail and Mountain Club, Honolulu.
Klahhane Club, Port Angeles, Wash.
Masamas, Portland, Ore.
Mountaineers, Seattle and Tacoma.
National Association of Audubon Societies, New York.
National Park Service, Washington.
New York Zoölogical Society, New York.
Prairie Club, Chicago.
Rocky Mountain Climbers Club, Boulder, Colo.
Sagebrush and Pine Club, Yakima, Wash.
Sierra Club, San Francisco and Los Angeles.

The bureau publishes an annual bulletin giving the officers, membership, dues, publications, lantern slide collections, outings, and other matters of interest of each club and society. Among their common aims, aside from the exploration and mapping of mountain regions and the ascent of leading peaks, are coöperation with the National Park Service in creating, protecting and developing our National Parks and Monuments, and in protecting trees and flowers with bird and animal life in their natural environment. Many of the clubs and societies issue illustrated publications on mountaineering, exploration, and conservation, and are educating their members by lectures and excursions to a deeper appreciation of nature.

Acquaintance with the literature of a subject is essential to efficient work in the field, and the bureau sends many important new books on mountaineering and outdoor life to its members. A large collection of mountaineering literature has been gathered in the central building of the New York Public Library, and the American Alpine Club has deposited its books therein, providing a permanent fund for additions. A bibliography of this collection has been published by the library, and a collection of photographs of mountain scenery is being formed to supplement the literature of a region with its scenery.

LEROY JEFFERS, Secretary.

476 Fifth Avenue, New York.

A Better Guide for the Blind Pedestrian

To the Editor of the SCIENTIFIC AMERICAN:

I have in mind a device which I believe to be new for the aid of the blind in walking.

My idea is to place on the end of a light walking stick a small wheel, say two inches in diameter, with solid rubber tire. The wheel is to be pivoted so as to turn in any direction, like the roller on a table leg. This cane would be six or eight inches longer than the ordinary cane, so that the wheel would run a few feet ahead of the man and act as a feeler, apprising him of each bump, step or unevenness in time to allow for it.

I believe one would become so practiced in the use of this that he would scarcely hesitate in stepping off an ordinary curb. If anyone will try to walk, blindfolded, over a short piece of walk in which there are a few small obstructions, first with an ordinary cane and then with a wheelbarrow, he will, I think, find a great difference. Of course this is crude, but in the absence of such a device it is perhaps the best way to approach the subject.

It may be that a metal tire would give better results than a rubber one. The cane should by all means be adjustable in length so as to suit the user. The wheel and all metal parts should be light and strong, probably of aluminum.

I have no thought of taking a patent on this, but simply believe it will benefit those blinded in the war, and select your columns as the best medium of publicity for such a suggestion.

PVT. ALEXANDER MCMILLIN.

Co. C, 11th Machine Gun Battalion.

Wireless Control in a New Dress

To the Editor of the SCIENTIFIC AMERICAN:

Your editorial in a recent issue, on the subject of radio monopoly, covered the ground thoroughly, and I am sure was greatly appreciated by the large number of your readers who are interested in radio. That pernicious bill was defeated and for a time all seemed well for the free development of the art.

On the 23d inst., however, I noted an Associated Press dispatch in the *Washington Star*, to the effect that an "Interallied Communications Conference" was to meet in Paris on January 25th, and among other subjects was to arrange for the "control" of radio after the war.

In consideration of the idea of control expressed by our naval authorities at the recent hearings before the Committee on Merchant Marine and Fisheries, one cannot help but wonder if there is not some plan on foot to obtain by means of an international agreement the monopoly that was denied by Congress.

I respectfully submit that our internal affairs such as the operation of small radio stations should not be governed by laws made abroad in this manner.

Would it be too much to ask of the SCIENTIFIC AMERICAN to look into this matter, and again sound the alarm, if need be?

JOHN V. PURSELL.

Washington, D. C.

Farming Implements

To the Editor of the SCIENTIFIC AMERICAN:

In these times when so much inventive and manufacturing enterprise is given to plowing machines and tractors, I have been surprised that some one does not go one step farther back and invent a digging machine to be operated by the weight of the engine, as a man uses his weight to operate a spade or digging fork. Such a machine for small holdings would have immense advantages over any kind of plow or tractor and could work areas even as small as one acre to any depth required and the weight of the engine would be an advantage and there would be no tendency to slip past the work to be done. Digging was the earliest and best method of cultivation and plowing is only a poor substitute, invented to save manual labor. Why should we not go back to the best system now that we possess that power that is adaptable? Bullocks and horses the first tractors of course, could not dig, hence the invention of plows.

W. E. ABBOTT.

Murrulen Wingen, N. S. W.

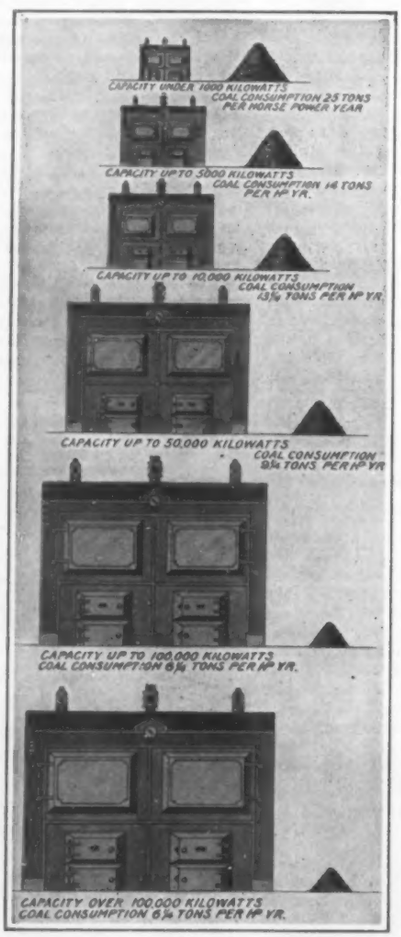
The World's Coal Supply

Where It Comes From and How It Is Used

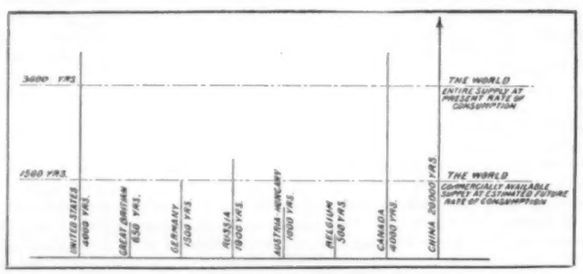
THE fundamental basis of civilisation is fuel; and the one universal fuel is coal. We burn wood and oil and gas when we can or when we have to; but we always recognize that these fuels are more or less substitutes for the standard fuel, the fuel upon which the industrial fabric really depends—coal. Accordingly figures bearing upon the supply and production and consumption of coal are always in order and always interesting. From a variety of sources too numerous to catalog there have recently come to our attention a quantity of statistics of this sort; and we present them herewith in painless form for public consumption.

In the first place, we are told that of all grades of coal ranking with or above bituminous, the visible supply is 4½ trillion tons. This includes all coal down to one foot in thickness and 4,000 feet in depth—extremes which under present methods are not usually within the possibilities of commercial use, but which will doubtless be made available by the time they are needed. This figure is imposing enough; but it does not transcend the human imagination by quite so much as it would have four years ago, when we were still counting in millions, rather than in the billions to which Liberty Loans have since made us accustomed. Indeed, from billions to trillions constitutes a leap exactly as long as the one which we have already made in passing from millions to billions.

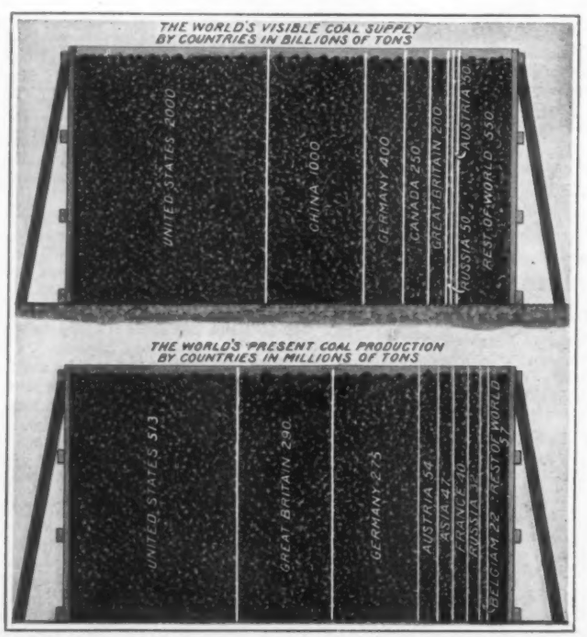
In addition to this vast hoard of combustibles which Nature has laid away for us, there may be some three trillion tons of sub-bituminous coal of various grades which does not, for the present, get inventoried with the other, and which we may accordingly ignore here—in spite of the fact that some parts of the world do very nicely with coal that is mostly lignite, and that everybody may have to come to it some day. Of the 4½ trillion tons that qualifies as regular coal, the United States is credited with nearly half—two trillion tons, to be exact. Next comes China, with a trillion tons; Germany with 400 billions; Canada with 250 billions; Great Britain with 200 billions; Russia and Austria with 50 billions each. The countries comprising the rest of the world are individually nowhere, though between them they muster the very pretty total of 550 billion tons. If we should descend to counting coal in mere millions of tons we should find France and Belgium leading the pack of also-rans.



How the rate of coal consumption drops as the size of the power plant increases; and the division among the countries of the world's visible supply and annual production of coal



How long the coal will last



Annual production naturally does not in every case follow the resources in magnitude. Of course the United States leads here again, with 513 million tons for 1913—which, as the last full pre-war year, has for the past four twelvemonths borne and is still bearing far more than its fair share of the burden of statistical service. But China and Canada, standing well up in resources, have developed these resources to such a small extent that the former is included under the general heading "Asia," which is credited with 47 million tons; while our northern neighbor suffers the even greater indignity of being lumped with "All Other Countries" in the production of 57 million tons. Germany and Great Britain, ranking fourth and fifth in the count of resources, are practically tied for second place in production, with 275 and 290 million tons, respectively. Then comes the former Dual Monarchy, with 54 million tons, and Russia with 32 million tons; while France and Belgium, not specifically mentioned under the head of resources, here enter to the amount of 40 and 22 million tons, in order.

Of course, it is a reckless assumption that production in this ratio will continue indefinitely. The very fact that some nations will approach before others the exhaustion of their deposits makes it obvious that this will not be the case. Still, the most illuminating way of showing up the relative rates at which the various countries are contributing to the fuel needs of the world, today, consists in showing how long their several deposits would last, at the current rate of depletion.

Making this calculation, we find that the United States is using up its coal at a rate of which would lead to exhaustion in 4,000 years; Great Britain in 650 years; Germany in 1,500 years; Russia in 1,900 years; Austria-Hungary in 1,000 years; Belgium in 500 years; while if we assume that the total production in the groups containing China and Canada, respectively, is practically all attributable to these centers, we can estimate that the Canadian fields would hold out for 4,000 years and the Chinese for five times as long. For the world as a unit the figure is 3,400 years; but this of course would be greatly reduced if the imperfectly explored Chinese fields should turn out to be a disappointment, either in accessibility or in workability or in quality.

As a matter of fact, however, a moment's reflection will make obvious that the world has not a coal supply for the next 3,400 years in sight. In the first place, we may reasonably look forward to a fairly constant increase in population, with consequent increase in consumption. And in the second place, it seems certain that as the Chinese fields are opened, the demands of China, now almost negligible, will be greatly expanded. The case can hardly be otherwise, for China's small coal consumption is due to no unwillingness to burn this fuel, but merely to her financial inability to burn it at the price which she would have to pay for getting it from any existing center of mining operations. Taking these and all related factors into consideration, one authority has suggested that the world's coal may reasonably be expected to hold out, under present methods of distribution and use, for about 1,500 years.

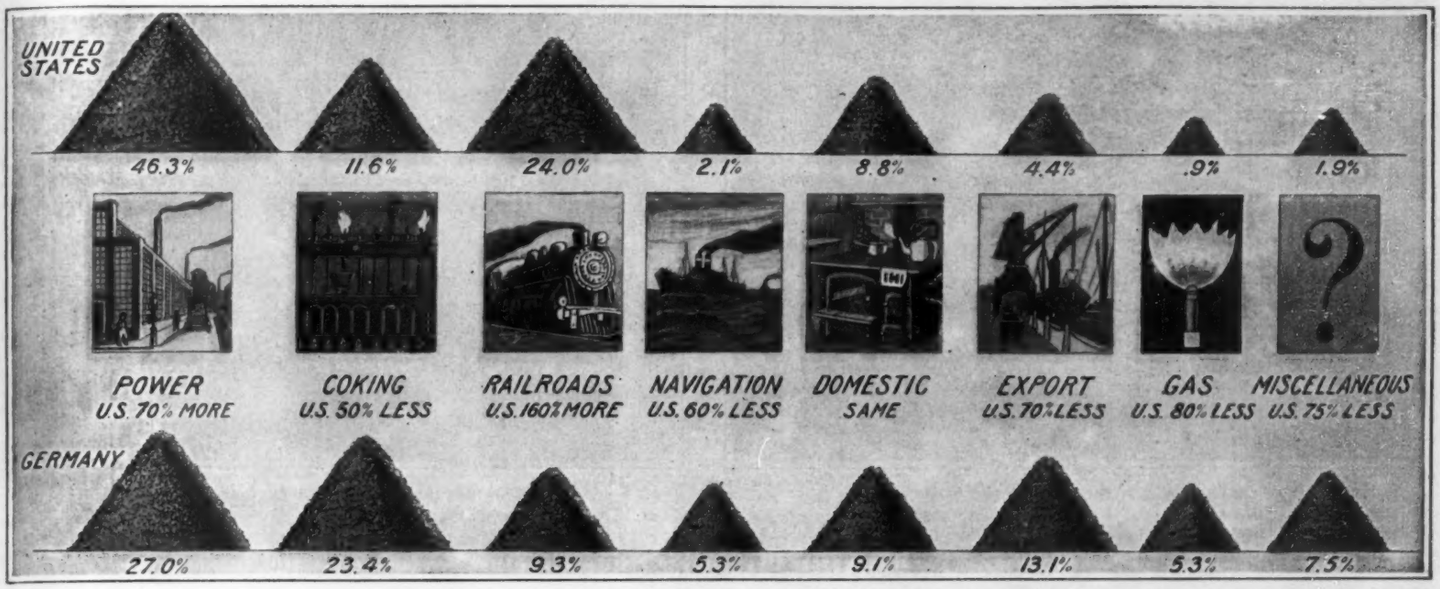
Some idea of just what these methods are may be got by glancing at a series of figures that have been compiled showing what was done with a normal year's production of coal in the United States and in Germany. The comparison is not a strictly accurate one, since in the United States a good deal of coal that is actually consumed in the heating of dwelling places gets charged to the production of power. Under all other heads the compilations appear to follow closely the same lines in the two countries, however, and may be taken as a reasonably fair presentation of the manner in which the use of coal varies between nations on the two sides of the big pond.

It is not necessary to incorporate the figures into our text, since they are to be found at the proper points in the diagrams herewith. It will be noted that we have made the comparison a fair one by ignoring actual tonnages and confining ourselves to the percentages of the national coal production used for each purpose. Any one who will, can convert them into actual tonnage by using the total production figures already given.

On the whole, the divergences between American and German practice are not extraordinary. The sum total of coal consumed for power production, before and after coking, is reasonably close in the two cases, though Germany makes a far better showing with regard to the amount coked before using. This, of course, gives her a real superiority, since the elements driven off in the coking, and recovered when that is carried on under modern methods, are of value and represent clear profit. Perhaps her advantage in the figures here may be taken as fair measure of the degree to which Germany has beaten us in the installation of by-product coke ovens to replace the old and wasteful beehive type.

Domestic use shows remarkable correspondence in the two countries. This must not be taken too seriously, however, in view of the inaccuracy of this item in the American figures. Certainly the impression prevails that we use a lot more coal in heating our houses hotter and longer than seems necessary to the European.

It is to be expected that of the coal produced and used in a compact area like Germany, less will be required for railroad use than is the case in a large territorial unit like the United States. For example, if all the coal mined in Pennsylvania were consumed within the state, and the balance of the country left to its own resources for fuel, no coal would have to be used up in carrying Pennsylvania's coal to other states. To be sure, Pennsylvania uses 15 tons per capita each year, while California, with its water power and its oil fields and its great distances from coal deposits, gets along with but ½ ton. Nevertheless, the transportation factor in the consumption of our coal is a real one, as may be realized when it is said that no less than one-third of all the freight hauled on our



Upper and lower figures represent percentages of annual production; figures in the center compare the two. Thus, we coke 50 per cent less of our coal than Germany does of hers

How Germany and the United States compare in the uses to which they put their coal

railroads is coal. Even so, the discrepancy between our showing and Germany's is considerably lessened when we recognize the great role which internal navigation plays in the continental system of distribution, and lump the items of coal for railroads and coal for navigation. Internal navigation is the factor of importance here, because the vessel that coals in Germany for a voyage here evens the matter up by coaling here for the return trip.

Interesting, even though of no practical consequence, are the calculations of a British contemporary who has looked into the question of the air necessary to burn up the coal that we use in a year. The accepted standard is 15 pounds of air for the combustion of one pound of coal. On this basis, and taking the world's consumption of coal to be 1,400 million tons per annum, the total amount of air needed in the combustion of this tonnage would be 21 billion tons, or 617 million million cubic feet. This amount of air would fill a cube of 16 miles, or a sphere of 20 miles diameter. Roughly it represents one 240,000th part of the weight of our atmosphere. So it appears that we shall have air to burn our coal with long after we have no more coal to burn.

When we talk about ultimate exhaustion of our coal we pave the way for discussion of means toward conservation. When we consider that the cheap coal always gets taken out first, leaving the inaccessible veins for a later generation, we must realize that coal will never get cheaper than it is, and will in all human probability continue to get more costly. Here is another and, it must be confessed, a far more immediate spur to economy in the use of coal. What are we going to do about it?

One thing that we are going to do about it, sooner or later, is to burn the coal in great central stations at or near the mines. In other words, instead of transporting the fuel to the user, we shall transport the power over long-distance transmission lines. Development of such lines and of the central power station itself are sufficient problems to absolve our engineers of any charge of neglect in that they have failed sooner to bring these conceptions into effect. When they do come into effect, however, it will be found that elimination of the burning of coal to transport coal is by no means the only saving produced. Canadian Government engineers, after a most painstaking survey of the field, have estimated the rate of consumption of coal in electric generating stations of various size, using coal-fired boilers. In a station of capacity under 1,000 kilowatts, the very best that can be hoped for is the generation of one horse-power per year for each 25.1 tons of coal burned. In stations running from 1,000 to 5,000 kilowatts capacity, the coal consumption should average 14 tons per horse-power per year. When the capacity is increased into the range 5,000-10,000 the saving is small, the coal consumption dropping only to 13.30 tons per horse-power per year. In stations whose capacity falls between 10,000 and 50,000 kilowatts, however, the coal consumption falls to 9.32 tons; for stations of capacity 50,000-100,000 kilowatts it is 6.57 tons; while in stations whose capacity exceeds 100,000 kilowatts, it has been found possible to furnish one horse-power for one year by burning only 6.25 tons of coal.

It must be remembered that this very advantageous figure has to do with plants in which all conditions are favorable; in particular, where the peak load is very moderate, and where the minimum 24-hour, 52-week demand for juice is a substantial one. No plant can create a record for low cost unless it runs substantially all the time at an approximation to full capacity. But when it does so run, results are little short of amazing to the commercial user of fuel, who, taking an average of the plants studied by these investigators, burns 23 tons of coal per annual horse-power in stations generating current for sale, and 33 tons in industrial power plants serving single factories.

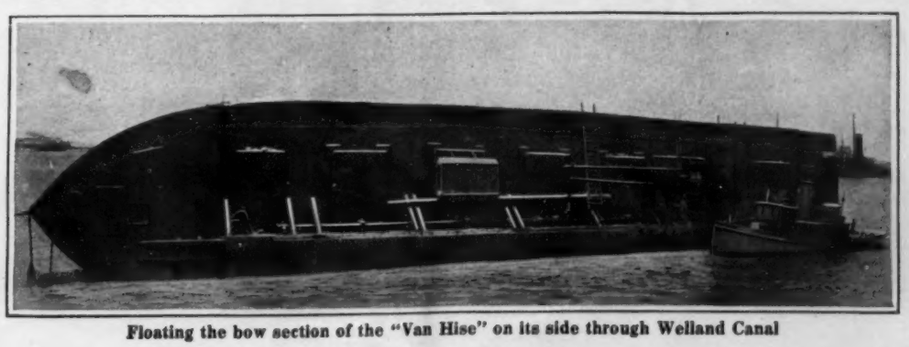
Passing a 50-foot Ship Through a 44-foot Canal

THE floating of lake steamers through the Welland Canal by cutting them in two so that the locks will accommodate them, and then rejoining the halves for ocean use, is by now an old story; but it has recently cropped up again, with a brand new angle. The latest ship to be floated through the canal in halves was not merely too long to be accommodated in the locks, but it was too wide to go through the canal at all; yet it made the trip successfully.

The answer to this seeming paradox, as shown in our cover of this week, was the idea of F. A. Eustis of the United States Shipping Board. Like the answers to so many knotty problems, it was simple enough, once Mr. Eustis had pointed out how it was to be done. The ship, a 10,000-ton freighter of 460 feet length and 50 feet beam, was bisected in the ordinary fashion; then each half was gently but none the less firmly rolled over on its beam ends to be towed through the Canal, which has a width of 44 feet only. Even so, it was a tight squeeze—so tight that the engineers in charge did not feel justified in taking any chances at all. So they constructed wooden templates of the vessel's cross-section, and took them to the canal; and they found that the "Van Hise" would pass through, rolled over on her side, with a clearance of eight inches on each side between her decks, or the keel, and the side of the big ditch.

As may be imagined, the task of rolling a 10,000-ton vessel on her side is no easy one. No attempt was made to do it by means of cranes or any such direct mechanical means. A series of big tanks was secured to what was intended to become the under side of each half of the ship, and these were pumped full of water. The calculations were well made, and the capacity of the tanks proved just sufficient to capsize the sections, which rolled gently over on their sides just five hours after the pumps were started. After the passage, the sections were rolled back by attaching similar tanks to appropriate points along the exposed keel.

One interesting feature is found in the fact that none of the machinery or heavier fittings were removed for the rolling and floating. Accordingly the refitting of the "Van Hise" for service, after she got through the Canal, will be a simple matter. We say will be, because while the passage of the Canal was made late in the fall, it was not planned to bring the two sections to their destination and fit them together until the coming of spring. One section of a freighter had already been lost in Lake Ontario last year, and the engineers were inclined to await a season when they would be taking no chances with the weather. It may be said that the joinings of ship sections brought through the Welland passage is effected at Montreal, whence the restored vessel proceeds under her own power; so the necessity for taking into account the crotchets of the weather man in towing sections through Lake Ontario is apparent.



Floating the bow section of the "Van Hise" on its side through Welland Canal

Chloroform Application by Tube

A NEW method of administering chloroform has been brought out in France by Dr. Guisez. He no longer applies it by the usual compress or mash placed over the mouth, but introduces the chloroform vapor directly into the lungs through a tube running into the windpipe. The tube method has already been employed in several hundred cases, and with great success. Besides being very useful for operations to be performed on the head and neck, it is of great interest because it never produces the nausea which is almost always the result of applications of chloroform in the ordinary fashion, and thus the patient is relieved of cause of suffering.

The effects of the new method will serve to explain the reason why chloroform applications always produced nausea when operating by the former method, for it appears evident that the nausea was caused by a part of the chloroform vapors being absorbed by the esophagus and the stomach. Of course this is not necessary, for the whole of the vapors should go to the lungs, and this result is now reached by the new method. It, therefore, marks quite a progress in the right direction.

Exercising stiffened hands and wrists

Machine for exercising the fingers and wrist

Human Reconstruction

How the War's Shattered Victims Are Reëducated for Civilian Life

NOT the least important part of any reconstruction program is the restoring of the maimed and crippled soldiers to a relative state of industrial usefulness. The European belligerents have long been faced with that problem, and ever since the maimed and crippled first began to flow back from the battlefields in the early days of the war, those countries have maintained hospitals for their care and schools for their reëducation. And now the United States is brought face to face with the same problem, which it has tackled with the same acumen as the other problems of modern warfare.

The first duty of a nation toward its maimed and crippled soldiers is to restore them to as near their former physical condition and usefulness as possible. Thus the soldier-patient is cared for until his strength is regained. If he has lost a limb, an artificial one is provided, after careful study and fitting to make certain that it comes as near replacing the lost limb as is mechanically possible. Then the patient is reëducated first in the use of the limb, and then in how to use it in a more or less prolonged course of occupational therapy. In instances where wounds have caused stiffness or loss of dexterity, a treatment is given, followed by a course of exercises tending to restore much of the original agility and dexterity of the muscles and bones.

How stiffened muscles and bones are again restored to their customary or near-customary state may be learned from the accompanying illustrations, which depict several mechanical devices which are typical of those employed throughout this country. In this case the devices are in use at the Clinic for Functional Reeducation of Disabled Soldiers and Sailors, and many of the patients are our crippled heroes of Chateau-Thierry fame, with the Marines well represented. The men are here supplied with artificial limbs, and at the completion of their training Federal agents will assist them in obtaining positions.

One of the devices shown serves to exercise the ankle and lower calf. It will be noted that the foot, which is attached to a turn-table, lifts a pound weight as it is turned from side to side. An indicator moving over a scale next to the turn-table indicates the effort expended.

A similar device is employed for strengthening the weakened wrist. The hand is strapped to a turn-table, and when moved from side to side serves to raise a two-pound weight in direct proportion to the power expended. A dial serves to indicate the effort, so that the strength of the weakened wrist can be constantly measured.

For curing flat feet and stiff legs the devices employed are of the simplest. In the former case the patient walks on two boards slanting away from each other, as shown. In the latter case the patient walks with one foot on a steadily rising platform and with the other on a horizontal platform, thus causing the first leg to be bent more and more.

Ankles may be strengthened by using another device shown, which causes the ankle to be worked from side to side. A similar machine strengthens the fingers and wrist. If the patient is unable to turn the wheel which operates this device, a nurse does it for him. In the remaining picture of this interesting collection are depicted several patients exercising their stiffened hands. The first man to the right is operating a dial arrangement controlled by a knob. As the knob is turned the rotations made by the hand are recorded on the dial. This eliminates any possibility of deceiving the doctor. The second man is operating a wheel arrangement for strengthening his fingers. The third and fourth men are undergoing finger treatment by means of weight-raising devices. As the fingers are raised and lowered, weights, which are connected through pulley arrangements to the gloves the patients are wearing, are moved proportionately.

Aside from these exercises which tend to restore the patient to a relative state of usefulness from the physical standpoint, the Government also provides a course in occupational therapy. This latter course has amply proved its worth wherever it has been scientifically provided, and increasing importance is being attached to it by physicians in military and other hospitals at home and abroad. It is now universally recognized that occupational work for the convalescent must be suited to the patient's condition and graduated to develop normal functional activities and ultimately normal vocational interests and capacities. Such occupational work provides an essential and scientific means of insuring so far as possible, in each case, complete and rapid physical, mental, and vocational rehabilitation.

Occupational therapy, it is further recognized, must begin in the very first stages of convalescence and must be continuous during the entire period of hospital treatment. Ward occupations must graduate into the more strenuous hospital workshop employments, the patient being thus graduated out of the hospital by easy stages into the vocational training school or directly into practical vocational employment.

Occupational therapy serves in many cases to keep the patient's mind off his misfortune and to keep him from worrying constantly over his physical handicap. Again, in some instances it is aimed to remind a patient of his condition in order that he will do everything in his power to overcome his disadvantage. It makes him follow the doctor's instructions. So it is evident that occupational therapy has a psychological application as well as a physiological one.

Take the weaving of baskets, for example, as an agent of functional restoration. The size, shape and weight of the basket determine whether the movements involve wrists, elbows, or shoulders. Large reeds and simple weaving require strength and broad movements, rather than skill and coördination. Raffia and an intricate pattern or stitch involve delicacy and accuracy. Fingers which cannot close about a reed of ordinary diameter can firmly grasp one of large diameter. As the fingers are thus unconsciously exercised the range of movement increases, and the fingers may progressively hold reeds of small diameter. Rope or twine in place of reeds will sometimes relieve muscular tension and give pliability to the fingers.

Whether the patient is conscious of work being definitely prescribed to aid his condition or whether he is thinking of occupation as a privilege not interfering with his recovery, the determining of occupation must always be a matter of serious consultation between the doctor responsible for the patient and the ward occupational thera-

Device for exercising stiffened feet

Machine for strengthening the ankle

peutist. Whether the patient knows there is a prescription or not is a matter of psychology; but it is always necessary that there be a prescription, and the results of occupational treatment should be charted.

Canadian figures, which are approximately substantiated by those of other countries, show that 80 per cent of the disabled in the hospitals are able to return to their former occupations, and that of the remaining 20 per cent, 10 per cent need complete vocational reëducation and 10 per cent partial vocational training. These figures are significant in their bearing upon ward occupations. It is evident that some of the reasons for selecting ward occupations that are vocational or prevocational do not apply in the case of patients who require no reëducational training. Although these patients need no training to become employable, their need of occupation must not be minimized from the standpoint of morale, therapeutic requirements, and cultivation of habits of work. Such patients constitute the largest group in numbers, being four-fifths of all. The influence of ward occupations is particularly important for them. The patients taking training will be able to adjust themselves to civilian life in the school or supervised shop.

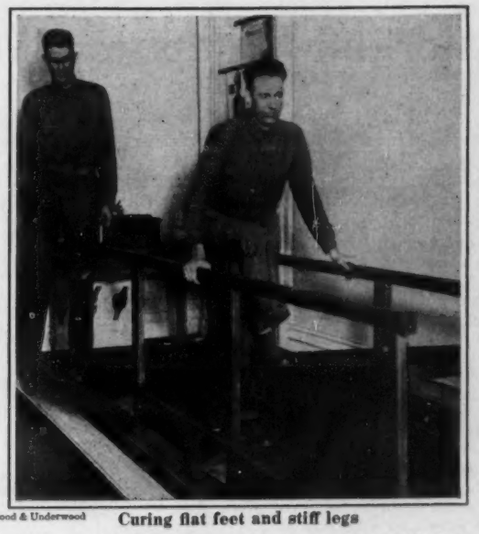
But for those who will have no such training the only opportunity for adjustment to work will be in hospital occupations. Thus, begun in the ward occupations and completed in the curative workshop, there must be some preparation for the demands of civilian employment. Regularity and habits of work must be learned, military customs broken down, and self-discipline and ambition reëstablished.

The great value of ward occupations from the educational standpoint is not so much the results achieved by vocational and prevocational training as it is the opportunity furnished for vocational finding. There are instances in all the countries of rare talent, genius, and bent being uncovered by ward occupations. This is not strange when it is known that the majority of men enter upon life occupations in a most haphazard way, and that few have had the opportunity either in their limited schooling or in their industrial experience of discovering their natural interests and aptitudes. Furthermore, the limited data which the vocational officer can secure during the preliminary interview on which to base a vocational scheme and the doctor's uncertain prognosis for the patient at this time, prevent a scientific and completely outlined course of vocational training.

There can be no doubt of it that ward occupations give an opportunity for occupational finding. They present many lines, and, as the patient tries them out and reacts, he may in a large measure determine his future. By the time the doctor is able to make a definite statement regarding his future physical condition, and the vocational officer able to secure detailed information to establish a proper training course, the patient will have found his own interests, and under careful guidance have formed his own desire and choice for training. Thus, as the curative workshop experience is in many cases vocational finding for the vocational school, so ward occupation is occupational finding for the curative workshops, and more remotely for the vocational school itself.

In sum, the reconstruction of our human material is a most important phase of the broader field of peace-day reconstruction. It is a vast undertaking, especially with our Allies and the enemy who have suffered to a far greater degree. Yet it is a consoling thought that with proper study and application much good can be derived from this sad task; that here and there a man, with latent talent and ability, can be set in his proper niche in the everyday world, there to score a success which repays many fold the work of those engaged in human reconstruction.

Machine for strengthening the wrist



Curing flat feet and stiff legs

Taste as a Chemical Reaction

THE sensation of taste, while of common and constant experience, is highly complicated in its nature. What is commonly called taste is not a simple sensation at all, but rather a complex. In addition to the actual functioning of the apparatus properly pertaining to the sense of taste, the tongue receives impressions of various other sorts, all of which go to make up this complex. As finally recorded in the consciousness, the taste of any substance has to do with its heat or coolness, perhaps with a mild amount of pain, certainly with astringency or acridity—which are in themselves further complexes of thermic and tactile sensations—and above all with smell. The reader will probably agree that ice cream and coffee are entirely different from their true selves when served at inappropriate temperatures; and it is a matter of record that a person of the keenest taste may make the most ludicrous errors if asked, blindfolded and with his nose stopped, to identify substances placed in his mouth.

Stripped of all externals and camouflage, however, there remains the unquestioned residuum, in the sensations received and transmitted from the mouth, which must be recognized as the true sense of taste. It is not nearly so diverse in its range as one might infer from the variety of foods which have their distinctive "flavors"; in fact, the psychologists agree that there are but four distinct taste sensations—those characterized as sweet, bitter, acid and salty. Confusion arises from the facts that the nose really does distinguish as many distinct odors as there are objects to be smelled, and that by virtue of its intimate connection with the olfactory organ, the sense of taste borrows a good many of these. But the simple fundamental fact is that these four are all the tastes there are, and that all flavors are combinations of these—and of the extraneous sensations already mentioned, of course.

Taste is obviously a chemical phenomenon; for it operates only in the case of substances which can be dissolved in the fluids of the mouth. The person who gets a chunk of lead in his mouth may rebel at the statement that since it is insoluble in the salivary liquid, he didn't taste anything; but it is a fact that the disagreeable sensations which he experienced were wholly those of touch and smell. The precise nature of the chemical reactions which lead to the process or act of tasting are not at all simple and, in many repects, are not yet well understood. Enough is known and immediately discoverable about the subject, however, to make it possible for two French investigators to write quite extensively upon it in a recent issue of *Revue Scientifique*, and doubtless a good many American readers will be interested in the translation of this paper, which appears in this week's SCIENTIFIC AMERICAN SUPPLEMENT.

Airplanes by the Hundreds

IN America, aviation figures have expanded beyond all expectations. Only back in 1916, when our punitive expedition went into Mexico, we had less than a dozen machines available; and less than a week later this aerial force, if it can be termed as such, was reduced to next to nothing.

At a recent celebration in San Diego, Cal., a fleet of 212 Curtiss J. N. type training planes flew for two hours over the city. The planes came from Rockwell Field nearby, and were manned by students training for service in the Army. As far as is known, the accompanying photograph depicting most of these machines in the air, shows more airplanes in flight than any published thus far.

Two hundred and twelve American training planes flying over San Diego, Cal.

Humpback Salmon on the Coast of Maine

THE Bureau of Fisheries continues its effort to acclimatize the humpback or pink salmon on the coast of Maine and is beginning to get encouraging results. An extensive planting of fingerlings, from a shipment of 1,000,000 eggs from Puget Sound, was made last Spring in Dennys and Pembroke Rivers. The Bureau reports that many thousand humpbacks entered rivers in eastern Maine in August, September and October, 1917, and specimens have been taken weighing 10½ pounds. It it stated that the humpback in its new environment retains its Pacific habit of proceeding to the ocean shortly after it begins to swim and returning to the rivers to spawn and die at two years.

World Markets for American Manufactures

Edited by LYNN W. MEEKINS

A department devoted to the extension of American trade in foreign lands

The Game Is On

AFTER four years of intensive training in export trade the United States is ready to meet the challenges which its allies in war and competitors in peace are hastening to declare. Until the terms of peace are settled there will be more or less uncertainty and lack of confidence, owing to the lack of a definite foreign trade policy; and until such a policy is formulated there will be a great deal of criticism of the Government in commercial circles. Lately Great Britain has announced the replacing on its list of prohibited imports of several commodities that did not require licenses for a while. American manufacturers affected are complaining bitterly, thousands' of dollars worth of orders being held up, and they want to know what our Government is going to do about it. In the rebuilding of the north of France, and Belgium, it is becoming evident that our merchants will not realize the titanic fortunes that many have anticipated; that France is able to take care of a fair part of its needs; and that Great Britain, Switzerland and Germany will contribute their share, the last-named in the form of indemnity. Toward the end of December it was shown that we no longer had the South American field to ourselves, the cotton-goods market in Argentina slumping badly because heavy consignments arrived from several producing countries. In the Far East, of course, we have had strenuous competition for some time.

Less than a year ago a British engineering firm sent to a prominent American manufacturer an order for steel sheets and plates, writing that "owing to war conditions, we are willing to waive the usual terms of payment against documents at Liverpool, and we have a confirmed credit with our bankers in New York, against which you may draw upon shipment of the material." Upon receiving a reply to the effect that the American company required cash with order, our friends across the sea hastened to voice their disappointment. "You blawsted Yankees may hold us up now," they raved, "but wait until this blooming war is over." The demands of the firm in the United States, however, were based upon good and sufficient reasons. To manufacture those sheets and plates, a priority order had to be obtained; to transport them to the seaboard, a railway shipping permit was needed; to send them out of the United States, an export license had to be secured. If the order happened to be cancelled before the shipment reached New York, the manufacturer would be involved in serious difficulties. And he was not compelled to run that risk, because he had enough business to keep his mills running 24 hours a day.

Trade Handicaps in Wartime

There have been many instances of the failure of foreign importers to understand that American exporters have been encompassed by a veritable maze of regulations and restrictions, and numerous complaints have arisen, reflecting unjustly upon our commercial practices. A man in Buenos Aires protested that he had paid in advance for a consignment of jewelry. Six months elapsed and shipment had yet to be made. The explanation was simple—no vessel could carry it, the few steamers on the River Plate run being needed for essential cargoes. There were numerous cases, too, in which an order, with or without a remittance, came from abroad to an American firm that was unable to acknowledge its receipt because of postal and cable censorship; and invariably the foreign customer condemned that firm—often other American business men as well.

Nothing is more injurious to trade than delay. Markets rise and fall, conditions change, buyer and seller drift apart. So it is our misfortune that, although the United States has been the principal source of supply, and in most part, the only source of the world's needs in manufactured lines, it has not been easy to purchase from us. Now that the clouds are blowing over it behooves us to remove all these difficulties and to make it decidedly worth while for our European and Asiatic and South American cousins to patronize our well-stocked store. We shouldn't go to the extreme of ramming merchandise down their throats or to the extreme of sitting back and doing nothing; but the thing to do is to send salesmen to describe the advantages of our products and to back them up with real service.

Making Better Products at Lower Cost

The mechanical ingenuity of American manufacturers is an advantage that weighs heavily in our favor. Up to 1914 a New York importer brought in large quantities of cheap cutlery from Germany. Most of this consisted of pocket knives that could be imported at a much lower cost than the prevailing price of American-made knives of the same grade. When the German supply was cut off the importer bought a small plant in New England and began to experiment, with the result that, despite the very high cost of steel, he succeeded in turning out a better product which he could sell at a lower price than he had received for the German knife before the war. Another example is even more striking. Until recently the United States has not been an exporter of earthenware. An Ohio manufacturer skillfully adapted hard-baked porcelain to large-scale production and managed to land his goods in South America more cheaply than the German manufacturer used to deliver them from Hamburg.

"The British have been successful in foreign trade largely because of their patience," remarked an American just back from England. "They say that we are too anxious to make a quick turnover and disinclined to tie up our capital. This is advanced as a serious obstacle to the establishment of the galalith industry in the United States. That product, an incombustible substitute for ivory and celluloid, comes from skimmed milk and the thicker slabs require many months in which to harden properly. It was made originally in Germany; now England is manufacturing it on a commercial scale. Attempts to produce galalith in this country have failed because the necessary capital was not forthcoming." The American export commission house thrives because so many of our manufacturers want to convert their goods into cash as soon as possible and do not care to wait until their products reach the foreign merchants to whom the shipments are consigned.

The feeling in American manufacturing circles that the Government is not adequately supporting our exporters seems unfounded when certain important facts are taken into consideration. There are two ways of meeting the moves of our competitors—by retaliation and by bargaining. We have the necessary machinery in the War Trade Board, the Shipping Board, the Federal Reserve Board and the Department of Commerce. The effectiveness of these agencies has already been demonstrated. When the British began to cut ocean freight rates the Shipping Board did likewise, meeting each reduction promptly. In the War Trade Board we have an instrument for combatting unfair restrictions of imports and exports by other nations; the Federal Reserve Board is having something to say about the exchange situation. Finally, the Department of Commerce is sending to all parts of the world as trade commissioners trained business men to seek new markets for the products of American factories. Such representatives in the past have diverted millions of dollars' worth of orders to the United States.

American Shoes Favored in Italy

IT seems strangely appropriate that the country shaped like a boot is a growing market for the American shoe manufacturer; and just as Italy's toe, dipped into the Strait of Messina, is rounded, so do the Italians like good, comfortable footwear and shun freak fashions. Men's and women's lines of typical American shapes and latest conservative styles are sold to the exclusion of shoes built on an exaggerated swing last or with an extremely pointed toe.

Before the war great quantities of shoes were supplied to Italy by Germany, and at a recent meeting of representatives of American factories the question was raised whether German firms had much chance of regaining their former hold. "From our experience I don't think they have, for a while anyway," said one of those present. "The manager of our branch in Milan is an American citizen, but his name is German. Shortly after Italy entered the war, an angry mob set out to destroy everything in the city connected with or suggesting the Teutons. Our man had to invoke the aid of the American consul in order to save our property."

Milan occupies the same place in reference to business in Italy that New York holds in the eastern part of the United States. It is the banking, credit and merchandising center. To compete permanently in the Italian market, American manufacturers should have agencies there. Italian tastes should be studied, full lines of samples shown, sufficient stocks carried, delivery guaranteed within a reasonable period, and, above all, liberal credit granted to established and reliable firms.

Greater Comfort Afforded by Our Footwear

"As to the comparative merit of the American and the English shoes sold in Italy," said a man familiar with the trade, "our footwear is of more attractive design and affords greater comfort, while the British product is provided with better sole leather and stands longer wear, making it more satisfactory. Nevertheless, American shoes are in strong demand owing to their superiority of workmanship, finish and style." The popular leathers are glazed kid, box and willow calf, patent colt and patent calf. Black is bought about four times as much as other colors. The American tourist who has worn tan shoes while traveling through Europe knows that few bootblacks outside of the larger cities are provided with yellow polish.

During the period of the war the United States furnished to Italy from four to five times the value of our normal share of imports, owing to our ability to supply goods in larger quantities than other sources. In connection with plans to keep a fair part of the Italian shoe business it is interesting to note the methods employed by British and by German exporters. The practice of the former in dealing direct with retailers in Italy results in a saving of middlemen's profits to the consumer and in a wide distribution throughout the kingdom. English makers are particular to meet Italian tastes in shapes, styles and weights. The Germans used to send traveling salesmen on regular trips to open credits and collect bills due. Advertising matter in Italian, quoting prices in Italian currency delivered in the town, was employed for trade development. C. o. d. packages were accepted by the German postoffice authorities.

The large numbers of Italians now returning home from the United States will augment the demand for American goods in Italy and at the same time improve standards of living. They will make fun of their countrymen who go barefooted and the latter will purchase shoes in order to be as well-dressed as they are. Although there is a growing shoe manufacturing industry in Italy, supplied mainly with American machinery, that country will be a large importer of footwear for many years.

Honduras Needs American Agencies

"IF the United States is to retain anything like its present share of the trade of Honduras," said a recent visitor from Tegucigalpa, "several general merchandising houses under strictly American management should be established without delay. The country is about as large in area as Cuba and although the population is probably not over 600,000 the market is worthy of closer attention than American exporters have given it. In Amapala, the only Pacific port of Honduras, which supplies all the territory between the borders of Salvador and Nicaragua, as well as the capital, Tegucigalpa, there is no place to buy hardware, farm machinery, motors, gasoline engines and other general lines. This business was formerly dominated by four powerful German import and export houses, which maintained numerous branches. Unless American agencies are placed in Amapala to handle imported American merchandise, for which there is a ready market, this lucrative trade must return eventually to German hands.

"Gradually the Hondurans are adopting foreign manners and customs in living and dress, but there are few American stoves, beds, bathtubs, and other household goods in use. Many articles that Americans consider necessities are not sold, yet the fact that nearly every humble home has a sewing machine and many boast a phonograph indicates that the people are becoming more progressive. Typewriters and cash registers are quite common, and wherever roads exist the automobile has been introduced. There is a demand for American footwear, high-heeled and ornamental shoes being preferred, and for ribbons, embroideries and laces. By keeping up the present standard in quality, granting liberal credits and carefully complying with packing requirements, American firms may hold Honduran business; but they must be more adequately represented."

Treatment of Infantile Beriberi

TIKITIKI EXTRACT has been prepared for some years by the Philippine Bureau for use in the treatment of infantile beriberi. More than 400 liters were prepared last year, and distributed mainly through the Liga Nacional Filipina para la Protection de la Primera Infancia. Thousands of children ill with beriberi have been saved by the administration of this prophylactic.

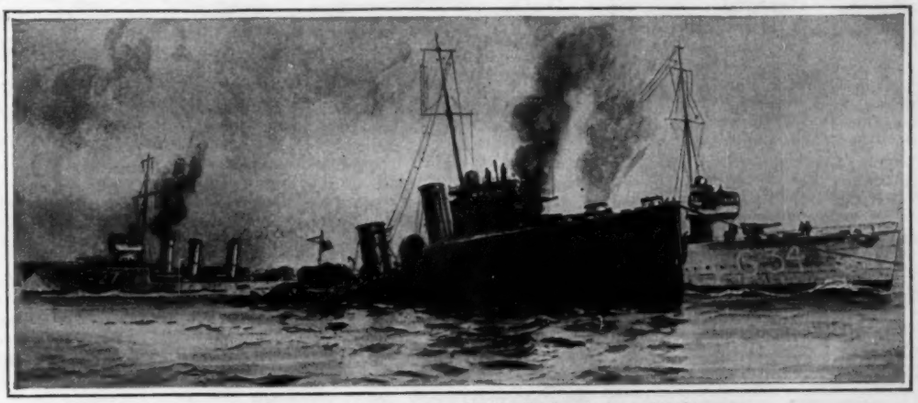
Making Two Destroyers Into One

THE destroyer "Nubian" of the British navy while in patrol, ran into a mine (probably when the stern was swinging over as the boat was turning), and the after-half of her was blown to pieces. Fortunately, the steel of her bulkheads was good and tough and the riveting well done, with the result that the forward half of the vessel remained afloat and was ultimately towed to a dockyard.

Another victim of the war was the destroyer, "Zulu," which touched off a mine that tore the forward third of the vessel apart and left it looking like the proverbial "pile of scrap iron." In this case, also, the bulkheads held and the salvaging vessels were able to tow the after-part of the "Zulu" to the same dockyards in which the "Nubian" had found refuge.

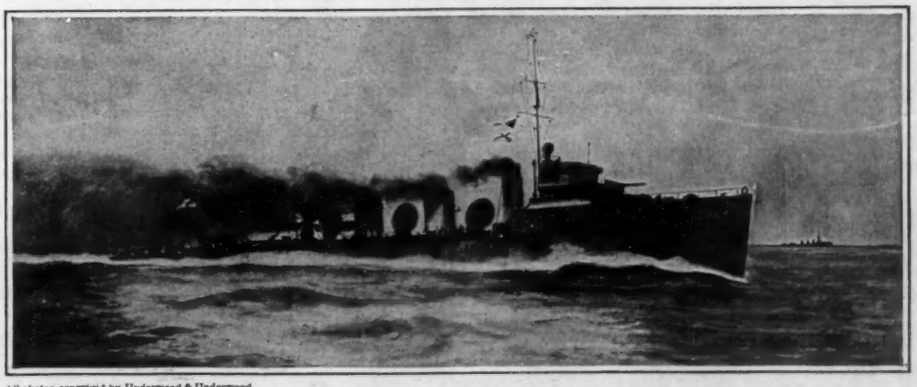
It is one of the fortunate circumstances attending the wrecking of ships by mines that the action of the high explosives is so swift, that it blows in the portion of the ship that is struck without seriously affecting the rest of the vessel; that is to say, a vessel may lose bow or stern, in fact may have it cut absolutely away, and still remain water-tight throughout the rest of her structure. This is what happened in the case of the two stricken destroyers; and all that was necessary was to cut away the wreckage, float the two destroyers (or what was left of them) into the same dry-dock, line them up to a common longitudinal axis, pump out the dock and proceed to fill up the gap between the boats with the necessary scantlings, plating, etc. Fortunately, they were sister boats of the F Class, the "Nubian" being built by Thornecraft and the "Zulu" by Hawthorne. Each is of 1,000 tons displacement and 33 knots speed.

In christening the nautical Siamese twins that had been thus produced, the Admiralty combined the names of the original two vessels, calling the new ship "Zubian."



Salving in the bows of the "Nubian" after being mined

Stern of the "Zulu" being towed home after the bow had been blown off



The two portions put together making a new destroyer under the name "Zubian"

The Mystery of the Boomerang

By P. A. Vaile

THE boomerang is the most wonderful example of an airplane volplaning to earth.

Everyone has seen the conjurer flipping his cards out over the audience so that they return to him. The reason for their coming back is, in the first place, that they are spinning. Every spinning thing tries very hard to stay in the plane of its rotation. That is why the top stands up and goes to sleep. That is the secret of the gyroscope, the scientific toy we all admire.

The cards obey the same law. If they had no spin they would fall as straight as they could to the floor, slipping in the air first one way, then the other, even as a coin sinking in water does. But with the card the spin prevents this side-slip. The card must obey the law of gravitation; but it is so light, and there is so much friction of the lower side, that it has no choice other than to slip back to the stage on the bank of air. This it accordingly proceeds to do, just as though it were sliding down a steep bank of ice. It is resting on a medium too dense for it to penetrate in anything approximating a vertical line so long as it spins.

That, briefly, is the explanation of why the boomerang comes back. This implement, as one may see, consists of a piece of bent wood, quite flat on one side and raised or curved laterally on the other. It is grasped firmly at one extremity and thrown away, spinning so rapidly that it is practically reduced to a circular plate of wood, of diameter equal to the straight line joining the two ends.

If we were to reduce the wood in the boomerang to a circular plaque of the same diameter, this would evidently be very thin. We should have then, in effect, a circular wooden card; but it would be so light, in proportion to its superficial area, that it would be practically worthless for throwing. In the boomerang, on the other hand, we have the concentrated weight for throwing, yet we get the effect of the plaque or card when the rapid spin effects the distribution the wood over the circle.

The boomerang, therefore, comes sailing back to the person who threw it, exactly as an airplane volplanes back to the earth. But to get the idea clearly we must imagine the airplane, instead of the ordinary wings, to have one or more large flat arms so placed that they represent a comparatively narrow section of the original plane, and revolving at a high speed. If this idea is carried out, we have a perfect analogy to the return flight of the boomerang.

The phenomenon consists simply in the return of an object to earth in obedience to the law of gravitation, through a medium thick enough to prevent its unrestricted fall. In the one case the plane is a fixed and permanent apparatus, with a definite area of sustaining surface; in the other, the boomerang presents a movable and varying quantity which, by its speed of rotary motion, makes up for its lack of superficial area and for the local mobility of its sustaining surface.

So much for how the boomerang comes back; I have said nothing of how it goes away. It may seem rather like putting the cart before the horse to deal with these two aspects in this order; but the fact is, the great mystery of the boomerang has always been its return flight. Its outward journey always seemed natural enough, even to those who did not understand it; for it went the way of all things thrown, away from the thrower. There are, however, several phases of this outward flight that are quite interesting.

I have referred to the boomerang on its return as an example of an airplane volplaning to earth. On its outward journey it is a good example of a plane climbing, but in this case the engine, that is the power of the thrower, is in full effect.

A consideration of this leads one to inquire whether it would not be perfectly feasible to build an airplane on the principle of the boomerang. This would mean a flat plane or wing revolving on a vertical axis in a nearly horizontal plane. This machine, shaped, if desired, approximately as the boomerang, and having its vertical shaft fixed to the plane as nearly as possible at the exact center of rotation, would, if driven by a suitable engine, fly and rise as surely as does the boomerang. It would be merely a question of calculating the necessary superficial area of the plane, and the deficiency from this figure which would be permissible on account of the rotation.

I have said that the plane might be flat; but it would probably be found desirable to have the outside edges, or the ends of the boomerang-plane, so curved that in spinning at a high rate of speed they would produce the effect of a shallow disc, as in the case of the clay pigeon. The latter, as most people know, is an inverted saucer, and a very good airplane—one which, so long as the spin lasts and the power of the trap that ejects it is felt, carries its own gyroscopic stabilizer. It would seem that this curved end to the boomerang plane would tend to preserve the normal airplane lines, and so to produce the vacuum upon which, we are assured, so much of the efficiency of a plane depends.

Not the least puzzling part of the outward flight of the boomerang is the manner in which its plane of rotation changes from nearly vertical to approximately horizontal. Pages of Euclid and of algebra have been offered in elucidation of this point—pages which I find much less convincing than the very simple idea which I propose now to advance.

The pull of the right hand and arm in throwing the boomerang is invariably inward. That naturally lays the plane of spin of the boomerang a little outward.

Everybody has seen how the boy's peg-top lies over at an angle until it finds its most constant axis—the vertical one—when it goes to sleep. It is, in my opinion, somewhat the same with the boomerang in the air as with the top on the floor. When the boomerang goes

(Continued on page 188)

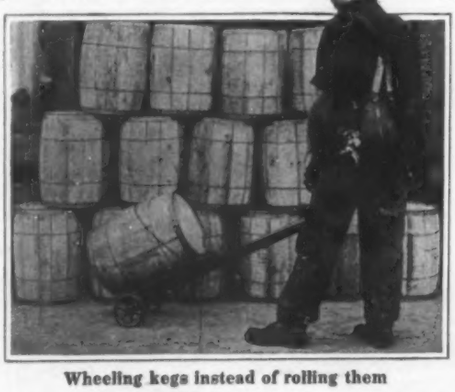
Inventions New and Interesting

A Department Devoted to Pioneer Work in the Arts

Device for Transporting Kegs

WHEN a heavy keg is to be moved the usual way is to dump it end over end or roll it, a system which often causes a lot of damage to the kegs and their contents besides being hard on the back of the man whose job it is to move them about. The conveyor here illustrated eliminates the backache and handles the heavy kegs in an easy manner, saving time and labor. The conveyor is shoved up close against the bottom of the keg and a wire loop attached to the device is thrown over the keg. The handle of the conveyor is then brought backward with a sudden movement which lifts the keg from the floor. The loop, of course, is essential in keeping the load from slipping.

This simple device has proven of great value where rapid transfer of kegs is desirable. It is fair to assume that the saving of time and labor, together with the added economy resulting from elimination of damage, should pay for the installation of the conveyor in short order.



Wheeling kegs instead of rolling them

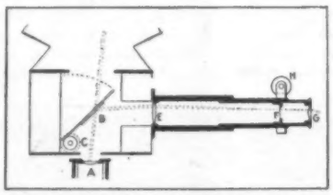
Improved Method in Photomicrography

FROM a British source comes the following interesting and valuable suggestion as to an improvement in taking photomicrographs of steel, that is, photographs of the magnified area of the crystalline structure of iron or steel.

In the ordinary vertical camera, in which the plate is supported at a distance of 10 inches or more above the microscope, the height of the focusing screen is often the source of much inconvenience; a further difficulty, which is specially marked when the camera is suspended in order to eliminate vibration, arises from the oscillation which almost inevitably occurs when the dark slide is opened. It was suggested that to meet these difficulties a means might be found of reflecting the beam horizontally and so adjusting the focus without the use of a ground-glass in the usual position. The telescopic arrangement here described was designed for this purpose, and resembles the ordinary form of reflex focusing camera. A similar device has been adopted in the Le Chatelier microscope and camera, but, in spite of its convenience, does not appear to be generally known in this country.

The construction of the apparatus, which might be attached to the front of any camera, is shown in the illustration, where the broken lines indicate the path of a beam which converges to form a point in the image. Rays proceeding from the microscope eyepiece A, which would normally converge to a focus on the photographic plate, are reflected horizontally by the movable mirror B; this mirror is attached to a metal plate large enough to cut off all light from the camera when in the position shown, and is prevented from passing beyond the 45-degree position by an adjustable stop attached to the spindle. The deflected beam is focused by the telescope objective E (focal length, four inches) upon the cross-wires F, and the image so formed is seen, together with the cross-wires, when examined through the eye-lens G (focal length, ¾ inch). The magnification thus obtained is about the same as that given by the use of a hand-focusing lens upon (or without) the ground glass.

It will be seen that to each length of camera there corresponds a fixed position of the focus at F, to which the cross-wires must be set by pushing in the sliding tube and closing the clamp H. It is convenient to graduate the sliding tube, by direct comparison with the ground-glass, in numbers representing the corresponding camera-lengths. When this graduation has once been made, it is sufficient, in taking a photograph, to fix the telescope for the proper camera-length and focus the microscope so that the image is clearly defined on the cross-wires. As soon as the focus is ascertained to be steady and satisfactory, the dark slide having been opened before focusing, the exposure can be made by simply turning back the milled head C, so that the mirror moves into the vertical position.



Scheme that adds steadiness and ease of focussing to photomicrography

The lenses described are of the simplest types and have proved quite satisfactory in working; the field is, however, rather narrow, about one-third of the diameter photographed being visible at once. It is suggested that the eyepiece of the telescope might be provided with a field-lens, and no doubt the full field could thus be obtained; at the same time it would certainly be well to make the objective achromatic. No trouble has been found to arise from the use of the mirror, which is a common plane galvanometer mirror, though the best result would no doubt be given by a silvered right-angled prism. For ordinary purposes the simple form described has proved sufficient and represents a considerable saving of expense in comparison with the more correct construction.

Electrically Heated Food Truck

HOSPITAL trucks which are electrically heated are proving a great comfort to the patients of the Massachusetts General Hospital, enabling them to be served with hot food. So often where the kitchen is at a distance from the rooms the food gets cold before the tray comes to the patient. This electrically heated truck has done away with that discomfort.

Electrically heated food truck for hospital service

The truck measures 61 inches long, 30 inches wide and 63 inches high and contains 15 trays. It is built of Russia iron with galvanized iron inside lining, and it is insulated with asbestos. The truck is mounted on broad rubber-tired wheels which makes it easy to push from room to room without the slightest noise. It is heated by the plug and cord connection made on each floor where the truck stands a few minutes waiting for the attendant to deliver the trays to the rooms.

The use of this truck will bring comfort to the sick people who find it hard to relish the half-cold food that is often put before them.

Eliminating a Railroad Waste

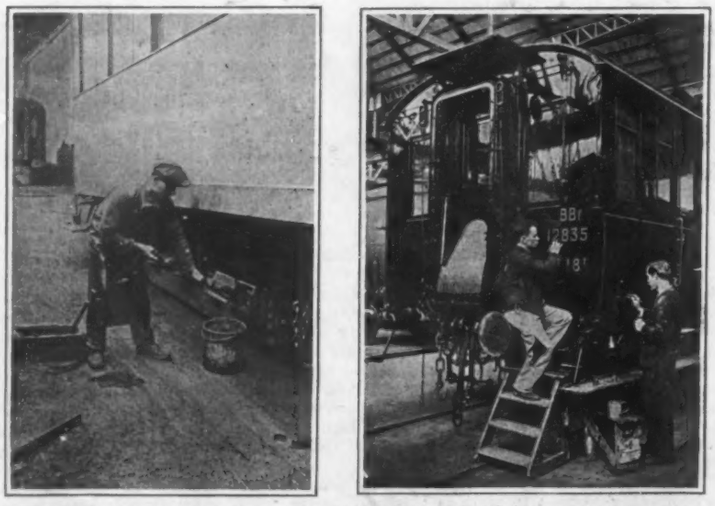
THE war has developed in a singular way the ingenuity of the technologists of all nations, who have been called upon to replace, by equivalents that can be obtained, materials which have become scarce or altogether unprocurable. By virtue of the constantly tightening Allied blockade, the German industries were the first to tread this path; and the Hun chemists have developed many an "ersatz," from war breads and aqueous solutions of dextrine for use as table oils, to elastic bandages without a trace of rubber. But little by little, France and England and the United States have had their attention drawn to the better utilization of manufacturing, agricultural and mining residues which heretofore, through ignorance or negligence, have been allowed to go to waste. And now that peace has returned, the question of economy remains a live one to every member of the business and industrial community.

Utilization is the spirit of the times; and in this spirit M. Alexander Grison, chief engineer of rolling stock on the Paris-Orleans Railway, has just worked out an original method of treating the rags recovered from the axle-boxes of his cars. These cars are equipped with boxes in which proper greasing is secured by means of a packing of woolen waste in direct contact with the axle-trees. Every three or four months the cars go to the maintenance shops, primarily for tire repairs; and at each visit the rags are removed from the axle-boxes and replaced by new. Previously the old rags had been discarded altogether, with a material loss of the textile itself, as well as of the oils and greases that it carried.

It is this loss that M. Grison has succeeded in eliminating. The technical details of his process need not be discussed here, since they comprise little more than an uninteresting series of boilings and dryings and filterings and decantations, in an interminable chain of vats. So we may content ourselves with the statement that, after he has squeezed every atom of utilizable material out of his old rags, M. Grison finds that he is able to show a notable quantity of grease, together with a perfectly good paint whose base is the metallic material taken up, in operation, by the waste, and recovered in the process of treatment. After all this the rags are in such condition that they may go back into the axle-boxes instead of into the trash-heap.

The shop in which all this is effected is a small one, costing but a few thousand francs for installation, and requiring but two men to operate it. After all necessary charges, the net economy to the company is about 100,000 francs per year.

(Continued on page 184)



Where economy begins and ends. From the rags recovered from the axle-boxes of a French railroad there is extracted paint for the cars, in addition to other items

RECENTLY PATENTED INVENTIONS

Pertaining to Apparel

GARMENT.—B. J. LAVIGN, 36 Green St., New York, N. Y. The invention relates to garments known as bloomers, and has particular reference to the string of the same. An object is to provide bloomers such as are worn in gymnasiums which can be quickly converted to have the appearance of a skirt. Another object is to provide a drawstring which has an elastic section the stretching of which is limited by a section of the drawstring.

Electrical Devices

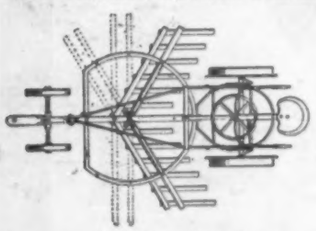
ELECTRICALLY CONTROLLED GAS ENGINE FUEL SYSTEM.—J. R. PATTINSON, care of Mrs. R. R. Pattinson, 128 W. 12th St., Hutchinson, Kans. This invention relates to a fuel supply system for internal combustion engines. It is especially adapted for small size engines so as to do away with mechanical complications. The general object is to provide a system of fuel supply for the engine, which system embodies a plurality of electrically operated valves controlled by a make and break device driven by the engine, which make and break device can be manually regulated for variable speed rotation or automatically regulated for constant speed rotation.

ELECTRIC MOTOR.—H. W. JEANNIN, 300 Porter Ave., Warren, Ohio. The object of the invention is to provide an arrangement of plates whereby the usual shell or frame is eliminated and the end plates are connected directly with the field. Another object is to provide a field of laminated material with punched sections which act as means for connecting the field with the end plates of the machine. A still further object is to provide an armature which is formed from laminae having depressed grooves similar to the field for holding the parts in proper alinement.

ELECTRIC SELECTIVE DEVICE.—A. H. MORSE, London, England. This invention relates more particularly to a selective calling device of the kind comprising a plurality of electromagnetically controlled switching device set to be operated in succession when a predetermined signal is received, thereby causing the alarm or other electric circuit to be completed only upon the reception of such signal.

Of Interest to Farmers

CULTIVATOR.—A. L. BAKER, Herman, Cal. The invention has for its object to provide a device adapted for all classes of work, wherein a supporting frame carries the cultivating mechanism which is adjustable with respect to the frame



A TOP PLAN VIEW OF THE CULTIVATOR

both vertically and angularly, the mechanism being sectional and capable of independent adjustment, and wherein means is provided for guiding the frame to permit the ground to be cultivated, close to a tree, without the necessity for the draft animals to pass beneath the branches.

SUGAR CANE PLANTER.—W. G. STEPHENSON, Ogdensburg, N. Y. This invention relates generally to the planting of sugar cane, the prime object being the provision of means to facilitate this operation through the use of a machine in which the operator may be transported along the rows or lines of planting, with means to carry the seed cane and feed the same continuously with the assistance of the operator, to the previously prepared ground.

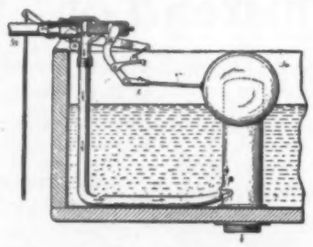
COW PEA HARVESTER.—A. E. REITZEL, 1302 L St., N. W., Washington, D. C. This invention relates to harvesters of that type attachable to mowing machines, and more particularly to one which derives its power from that developed by the traction wheels of the machine to which it is attached. The prime object is to provide a simple machine by which cow peas may be harvested with but a single operator. Another object is to provide a flexible machine attachable to the knife bar of a mower, of such a nature that the knife bar may be raised and lowered when desired with but little effort.

HEADING KNIFE FOR MILO AND THE LIKE.—R. L. DAVID, address O. D. Richardson, Room 3940, Knox Building, San Jose, Cal. The invention relates to heading knives adapted to be applied to the right or left hand, and particularly intended for use in harvesting milo, Kafir corn, Egyptian corn, and the like. The invention relates to knives of the type including a finger blade and a coacting relatively fixed cutter disposed on the hand at the palm. An object is to provide an arrangement of straps for securing the hand-piece to the hand.

Of General Interest

ROAD OR HIGHWAY CONSTRUCTION.—S. N. CORNWALL, 2129 Laura St., Jacksonville, Fla. The object of the invention is to provide a durable construction by which a cheaply constructed concrete body and surface will be presented for travel. The roadway embodies parallel longitudinal strips embedded in the road surface, formed of concrete and having laterally disposed connecting ties, the strips having expansion joints and reinforcing members embedded at their ends, certain of which extend through the lateral ties others of which bridge the expansion joints.

FLUSHING DEVICE.—I. SIMOVITZ, 918 Freeman St., Bronx, N. Y. The object of the invention is to prevent the waste of water generally attendant with the use of ordinary flush valves in low down or overhead toilet tanks;



SHOWING THE PARTS IN POSITION WHEN OPERATING CORD HAS BEEN PULLED

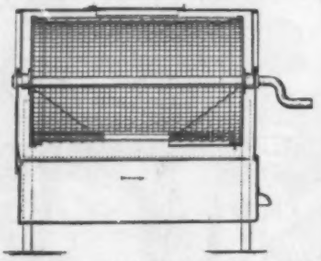
The invention is characterized by the provision of an operating mechanism with an ordinary inlet valve causing an inrrush of water when the lever is operated and the siphoning and emptying of the tank and the automatic reconnecting of the float to shut off the valve when the tank is again filled.

SACK HOLDER.—H. T. POTTER, Leonardsburg, Ohio. The invention is of general use as a sack-holder for holding the sack while being filled but is more particularly intended for use on the grain spouts of threshing machines. An object is to provide means that will readily adjust itself to various thicknesses of sack material, and means that will not tend to open under the load as the sake is filled.

CHAIR.—H. SAYLES, care of North River Hotel, Barclay & West St., New York, N. Y. The invention has for an object the provision of an arrangement of springs for acting in the double capacity of cushion and elevating means for assisting in causing a person to rise from the chair. Another object is to provide a chair with a swinging seat section with springs for holding one end of the bottom or seat elevated and means for limiting the elevating action.

THERMOSTATIC TRAP.—R. N. TRANE, La Crosse, Wis. The object of this invention is to provide a construction whereby a thermostatic member is used for giving back and forth movement to a valve member in order to open and close the same under varying conditions. Another object is to provide a trap with a valve member operated by a thermo-member held in place by an adjustable support. A further object is to provide a member which in a small space will give a long thrust by reason of its spiral shape.

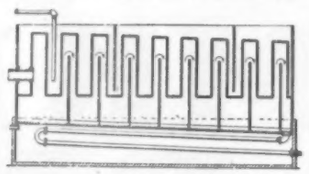
ASH SIFTER.—J. ROSSI, 401 E. 100th St., New York, N. Y. The invention relates particularly to a dustless ash sifter, among the objects is to facilitate the emptying of the recovered coal and coarser material. The sifter comprises a rotary drum constructed from open-mesh mater-



A VERTICAL SECTION OF THE SHIFTER

ial; means are provided for rotating the drum, and a draw is provided for receiving the ashes; the coal or large particles remaining in the drum may be delivered to a receptacle, through an opening provided in the drum, the device is enclosed in a boxlike casing.

CONDENSER.—M. T. BROWN and G. W. SOUTHERLAND, care of George W. Southerland, Naval Stores Equipment Co., Box 92, New Orleans, La. This condenser relates more particularly to condensers adapted for use in connection with apparatus for manufacturing



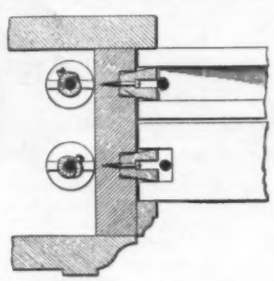
A VERTICAL LONGITUDINAL SECTION

turpentine. One of the objects is the provision of a condenser which receives the vapor from the still, condenses it and the discharges it therefrom. Another object is to provide means for retarding the passage of the vapor therethrough whereby the vapor may be completely condensed.

BOTTLE HOLDER.—MARY L. KAYSER, 780 S. Clayton St., Tyler, Texas. This invention relates to means for preventing upsetting of bottles on desks, or tables, with a particular reference to ink bottles on school children's desks; the main object thereof is to provide such means in a simple, efficient, and inexpensive form, either for detachable or for permanent connection with a desk or table.

PUMP.—C. H. FRALEY, Lynden, Wash. The invention has for its object to provide a pump for use with flowing water, and adapted to be submerged in the water, and having an intake provided with a turbine propeller which is connected to the pump in such manner that the movement of the propeller driven by the water will operate the pump, and wherein a double pump is provided driven by the propeller arranged in a common intake for the pumps.

WINDOW.—W. S. SHIELDS, 312 Bert Ave., Trenton, N. J. The object of this invention is to provide mechanism in connection with the window casement and the sashes for guiding the sashes in their movement in the casing without binding or sticking and for serving as a parting strip to



A SECTION

permit the usual parting strips to be dispensed with, and so arranged that the guide strips may contract and expand without interfering with the movement of the sashes; the strips have their sides inclined to facilitate removal, and to eliminate splitting when fitting or making repairs.

PROCESS FOR MANUFACTURING GASES.—H. F. FREULER, care of The Baker Loan and Investment Co., Walla Walla, Wash. This invention has particular reference to the production of carbon monoxide and hydrogen. The object is to provide a process for making gases wherein a mass of carbon substance is electrically charged by an initial current of comparatively high voltage whereby the carbon is heated after which the voltage may be reduced and steam passed through the mass whereupon the oxygen of the steam combines with the carbon and leaves the hydrogen free thus forming the gases.

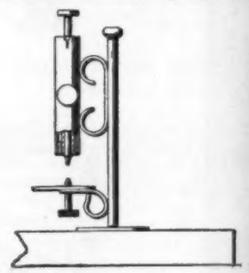
Hardware and Tools

OVAL COMPASS.—J. H. C. BEISSWENGER, 790 Hunterdon St., Newark, N. J. Among the principal objects which the invention has in view are to provide means for mechanically controlling the path of a marking member for producing an oval outline, to adjust the compass readily, to provide means for varying the range of the marking member, and to simplify the construction of the compass.

DEVICE FOR HANGING CIRCULAR SAWS.—O. SCHULER and W. BUSCHMANN, JR., Haldon, N. J. The invention relates to means for automatically centering the saw on its arbor while clamping the saw. A more specific object is the provision of a centering device including a beveled split ring which enters the arbor hole of the saw, which hole is beveled to correspond to the beveled saw-engaging portion of the ring, and in combination with a ring is a spring-pressed follower which acts on the ring to thrust the same in the arbor hole of the saw.

ROTARY IMPACT TOOL.—M. SMITH, address Miss D. Whitney, care of Title and Trust Co., 91 4th St., Portland, Ore. The invention relates to that class of rock drills in which the drill steel may be given a rotary as well as an axial movement. One of the main objects is to provide means which will be at all times under the control of the operator for accomplishing such rotation, thereby accommodating the drill to the different kinds and characters of rock and enable him to use just the necessary force at all times.

GAGE.—J. B. JONES, Box 83, Brookville, Pa. The invention has for its object to provide a gage especially adapted for jewelers use, for measuring uneven surfaces. The gage comprises a standard, a table supporting the standard, a plunger casing



A SIDE VIEW OF THE DEVICE, PARTS IN SECTION

supported above the table, a plunger mounted to reciprocate in the casing, a spring normally pressing the plunger downward, means for limiting the downward movement of the plunger, and a set screw threaded through the table for cooperating with the lower end of the plunger.

PLANT SETTER.—A. W. REEKS, 444 Park St., Upper Montclair, N. J. The invention relates to horticultural apparatus, and has particular reference to garden tools for the handling of small or young plants. Among the objects is to provide a hand tool for the purpose of setting out or transplanting young plants, having in view the least possible disturbance of the delicate rootlets of such plants, whereby a plant may be transplanted without being subjected to the shock commonly incident, where soil is loosened at the roots.

TOOL HOLDER.—N. H. GROFF, 330 Cricket Ave., Ardmore, Pa. This invention relates more particularly to that form of tool holder employing a cross slide arranged to receive the tool, and adapted to be adjusted transversely to the axis of rotation of the holder. The invention is especially intended for embodiment in that type of tool holder adapted to be held in a block carried on a revolving turret which moves toward the work, the work being rotated in or by a chuck or the like.

EXPANDING MANDREL.—G. RILEY, Box 357, Morenci, Ariz. The invention has for its object to provide a device adapted for use in lathes and the like, wherein a central spindle is provided having intermediate its ends a portion rectangular in cross section and tapering from one end to the other, together with a series of shoes adapted to fit and engage the portion to be expanded and contracted by moving the shoes longitudinally.

JACK PLATE.—H. C. BARNETTE and R. M. MASSEY, Bixby, Okla. The object of this invention is to provide a device for supporting oil well jacks, wherein the plate consists of two portions, one engaging the base, the axis rod of the jack resting upon the other, the said other plate being adjustable with respect to the first named plate. In use, the rod of the jack is arranged in the bed, or lower section, and by means of set screws the jack and beam may be lined up correctly.

AUTOMATIC LOCKING DEVICE.—O. F. ENSION, 720 Davison St., Defiance, Ohio. This invention relates to nut locks, its object is to provide a locking device arranged to lock a screwed up nut in place on a bolt to protect the nut and its locking device against rain, snow, dust and other extraneous matter, to allow of locking the nut at the sides or at the corners thereof, and to permit unscrewing of the nut whenever it is desirable to do so.

Household Utilities

CONVERTIBLE BED.—T. BLOOM, 515 Neptune Ave., Coney Island, N. Y. Among the principal objects which the invention has in view are to adapt a child's crib for use by an adult, to quickly convert a crib into a single bed or couch for an adult. When the crib is desired for use as a bed, extensions are drawn from the tubular side bars to be used as supports, and the footboard is swung on its hinge bars to a lowered position to provide the required length for an adult.

(*Continued on page 180*)

Born of war's necessities

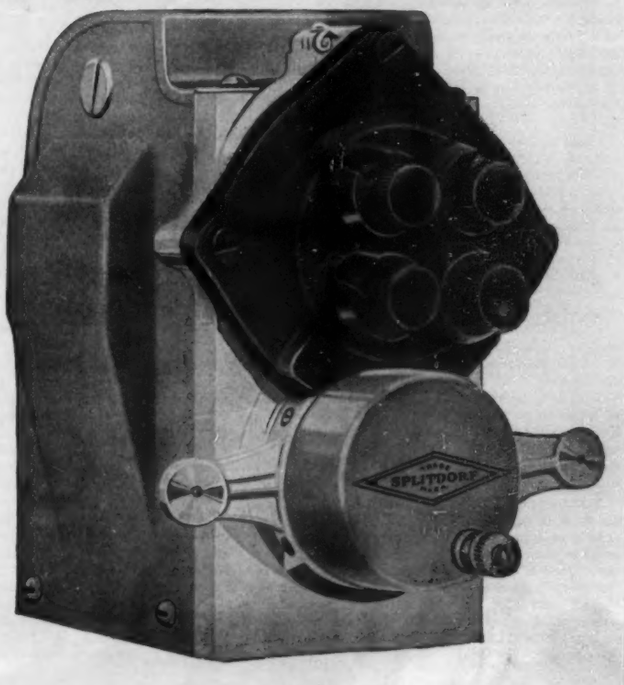
The war proved conclusively that the magneto is the only form of ignition that is thoroughly reliable under all conditions. It is the only system that does not demand constant attention. It is the only system that does not require costly renewal every few months.

Aero MAGNETO

The AERO is the magneto in its highest perfection. This magneto of unequalled reliability and efficiency was developed by Splitdorf engineers to meet the war's needs for an ignition system that should be free from all the uncertainties and all the faults of battery systems.

As standard equipment on airplanes of the U. S. and Allied Governments, the AERO Magneto won new laurels for magneto ignition and forever settled the question of whether battery ignition can compete with the magneto for any ignition purpose where FIRST cost is not the main consideration.

The AERO Magneto is now available for passenger cars, trucks, tractors, motorcycles and all other interna! combustion engines.



Sumter Starter Coupling
Makes starting of even the largest and heaviest engines directly from the magneto safe, sure and easy.

SPLITDORF ELECTRICAL COMPANY
Newark, N. J.
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Also Makers of DIXIE and SUMTER Magnetos, Plugoscillators, Spark Plugs, etc.

RECENTLY PATENTED INVENTIONS

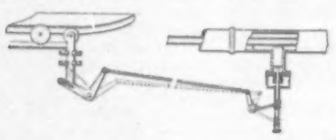
(Continued from page 178)

Machines and Mechanical Devices

DICING MACHINE.—A. SCHAFFER, 234 E. 12th St., New York, N. Y. This invention relates to a machine whereby fruit or vegetables can be automatically cut in any desired size of piece of angular cross section. An object is to provide an automatic machine which is simple in construction and with which dicing can be easily and quickly accomplished.

STEEL PULLER.—M. S. RUNSVOLD, 4161 Front St., San Diego, Cal. The object of the invention is to provide mechanism for pulling jammed steels from drill holes. The device comprises an internally threaded shell, a screw, a longitudinal axial opening for permitting the shell and screw to be slipped over the steel, a pair of dogs pivoted to the screw on an axis transverse to that of the screw for engaging the steel to clamp it to the screw to constrain the steel to turn and move longitudinally when the steel is turned.

PISTON SUPPORTER.—W. TINDER, J. STAEMPFLI and J. N. MILES, Slidell, La. The invention relates to saw mill feeds and provides a device to support the piston rod and prevent it from sagging. A supporting head is slidable into engagement with the under side of the piston and



A SIDE VIEW OF THE SUPPORTER WITH PARTS IN SECTION

a spring normally tends to retract said head from the path of the piston. The device is controlled by the saw mill carriage which engages a trip after the piston has passed the supporting head and causes the head to move against the piston into supporting position.

GEARING.—W. W. HUDSON, 159 Pierpont St., Salt Lake City, Utah. This invention has for its object to provide mechanism especially adapted for connecting a driving shaft with a gear ring of the character used in ball mill or rotary kilns, in ore grinding and cement work. The gearing comprises a ring having internal and external gear teeth, fixed bearings for the ring, and a shaft passing eccentrically through the ring and having a pinion engaging the teeth of the internal gear.

LUMP SUGAR DISPENSER.—A. R. LISSMANN, 213 Fourth Ave., New York, N. Y. The invention relates to a dispenser especially designed for delivering lump sugar, one lump at a time, the general object is to provide a simple and attractive device which keeps the sugar in a sanitary condition, so that the lumps can be dispensed by the operation of a lever or handle. The dispenser is an attractive table article for use in homes, hotels, or other places.

TYPEWRITER ATTACHMENT.—M. M. SORENSEN, 4401 Broadway, Chicago, Ill. The invention relates to a basket that may be quickly and easily secured to a typewriting machine. An object is to provide a basket for presenting envelopes in close proximity to the feed rollers of typewriting machine and to provide space in the same basket for receiving the addressed envelopes.

INKING ROLL TRUCK.—F. J. BRADLEY and M. C. DIONNE, Fostoria, Ohio. This invention relates more particularly to an expansible roller arranged to be fitted on each of the trunnions of an inking roll. An object is to provide an inking roll truck including a relatively fixed expansion rim with a relatively movable expansion cone, a plurality of expanding segments located between these members, being adapted to increase the diameter of a tire located between the cone and the rim.

LABELING MACHINE.—E. R. ALLING, care of Alling-Lauder Co., Sodus, N. Y. This invention has particular reference to a machine for labeling fruit cans or the like. Among the objects is to provide means for controlling a stack of labels in such a manner that they will be delivered singly in succession to the individual cans as the latter are rolled over the stack of labels. Another object is to provide facilities for supplying paste to one end of the labels.

FOLDING TYPEWRITER.—E. KRUSIUS, 325 E. 66th St., New York, N. Y. The invention relates to typewriting machines adapted for the greatest convenience in transportation. Among the objects is to provide a frame or base jointed transversely so as to fold so that the front portion thereof may fold upward around a horizontal axis parallel to the key board. Another object is to provide locking means to hold the base in rigid flat operative position.

FEEDING DEVICE FOR PEGGING STRIPS IN PEGGING DEVICES.—J. LARSEN, Copenhagen, Denmark. The invention relates to pegging soles on boots and shoes. It comprises a feeding device for the pegging strips of pegging machines, a sliding and spring pressed cylinder, a spring pressed and sliding gripper, in the cylinder the gripper being free to move laterally, cooperating means on the cylinder and gripper for moving the latter laterally, and means for sliding the cylinder against the action of its spring.

MECHANICAL MOVEMENT.—F. MAIER, 231 Niles St., Elizabeth, N. J. The object of the invention is to provide a mechanical movement arranged to convert continuous rotary motion into intermittent rotary motion in a very simple and efficient manner, exceedingly serviceable in sewing machines, moving picture machines and other machines. In order to accomplish this result, use is made of a continually rotating driving shaft, an intermittently driven shaft, a transmission member and means imparting a continuous reciprocating sliding motion to the said transmission member.

Musical Devices

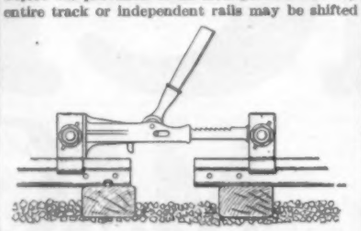
VIOLIN CHIN REST.—A. G. PINFOLD, care of Metronome Works, Bradford, England. The object of this invention is to provide a device of novel construction adapting the same to receive and hold a mute of any desired form when not being used, thereby preventing loss of the mute and the possibility of mislaying it, whereby it cannot be instantly used whenever desired. The device consists of two plate members, and rods connecting the same, one of the plates being formed with a recess for holding a mute.

Prime Movers and Their Accessories

INTERNAL COMBUSTION ENGINE.—S. MOORE, New Smyrna, Fla. The invention relates more particularly to an engine of the four-cycle type, the prime object being the provision of an engine in which the fuel oil is supplied to the working cylinder apart from the air necessary for combustion. In this device the fuel oil is maintained separate from the air until the time arrives at which the explosion is to take place and it therefore obviates many of the difficulties experienced in the usual type of engine where the fuel oil enters with the air in gaseous form.

Railways and Their Accessories

TRACK SHIFTER.—W. M. WISE, Rentor, Wash. This invention relates to means for use in setting and readjusting tracks, it has for an object the provision of an arrangement whereby entire track or independent rails may be shifted



SIDE VIEW OF THE INVENTION APPLIED TO RAILS

quickly without interrupting the traffic passing thereon. Another object is to provide a quickly adjustable gripping structure, for use in connection with an ordinary jack for acting on the rails and causing the longitudinal movement thereof for resetting or the position thereof.

WINDOW.—S. B. ZIMMER, El Centro, Cal. The invention has for its object to provide mechanism in connection with the windows of railroad cars for permitting the window opening to be completely or partially closed, and to bring the partial closure at any part of the casing. With the ordinary curtain used in car windows the opening must be at the bottom, if a small opening is desired. With this construction occupants may view the scenery or obtain fresh air without the necessity of exposing the entire body.

Pertaining to Recreation

TOY MACHINE GUN.—J. B. BLACKSHEAR, 113 Hotel St., Honolulu, Territory of Hawaii. The invention relates to a toy gun in which projectiles are fed from a magazine and discharged by a firing plunger which is actuated to discharge the projectiles in quick succession. The object is to provide a gun having a feed slide coordinated with a spring-pressed firing plunger, the two being controlled by a revolving trigger in a manner to cause a feed movement of the slide and a rearward movement of the plunger to compress its spring and then release the plunger.

NURSERY BEAD OR BLOCK.—L. MORSE, 35 W. 36th St., New York, N. Y. This invention relates to nursery toys and has particular reference to playthings for babies or small children, providing in such playthings the highest degree of safety as well as amusement. An object is to provide a toy that is practically indestructable, and more-over one that is sanitary and hence well adapted to be inserted into a child's mouth with impunity.

TOY.—W. LEVIN, 60 W. 101st St., New York, N. Y. Among the principal objects of the invention are to construct dolls and like articles from tubular members of conventional shapes, to provide flexible fixings for such tubular shapes for simulating articulated junctions, and to produce a toy at a reduced cost. The forms are such as may be turned out by a machine for manufacturing wood grills or wooden beads.

ANIMAL TOY.—A. E. WOOLNOUGH, 66 Hale Ave., Brooklyn, N. Y. The invention relates to animal toys mounted on wheels to be drawn along the floor, its object is to provide a toy of the quadruped type and which is exceedingly strong and durable, cheap to manufacture, with legs and wheels properly spaced on the axles to prevent binding of the wheels on drawing the toy along.

Pertaining to Vehicles

DEVICE FOR CONTROLLING SHOCK.—C. B. BILLINGHURST, 303 Dakota Ave., Pierre, S. D. The object of the invention is to provide mechanism for use in connection with motor vehicles of every character, for absorbing shock or jar resulting from the movement of the vehicle over the road and wherein a form of flexible hanger connection is provided for interposition between the body and the axles of the vehicle.

SPRING WHEEL.—LE ROY B. CARRIS, Sioux Rapids, Iowa. The invention has for its object to provide a wheel wherein mechanism is provided for imparting the resiliency of the pneumatic tire without the consequent cost of the said tire, and wherein a puncture-proof construction is obtained. The tire consists of a casing, a split rim, means for connecting the casing and the rim, pairs of coil springs arranged radially within the casing a shoe for each pair of springs and means for limiting and cushioning the outward movement of the shoes.

DOUBLE DRIVE GEAR SET.—I. L. STONEY and A. B. BOWMAN, Alma, Mich. The invention relates generally to drive means for automobiles and the like and particularly to a gear set which will take the place of the ordinary transmission as used on such vehicles, the object being the provision of a gear set which will combine the feature of making it possible to drive with all four wheels, the arrangement being such as to obviate the necessity of any form of transmission chain and permit of a direct drive from the gear set to both the front and rear axles.

DISPENSING SYSTEM.—J. M. PERLEY, 208 E. McPherson St., Kirksville, Mo. This invention has for its object to provide mechanism for permitting a motor vehicle to be simultaneously supplied with fuel, oil and air for the tires, wherein reservoirs are provided for the fuel and oil, and pits for containing the air supply pipes, the pits being arranged in such manner, that when the vehicle is driven alongside the reservoirs for fuel and oil, the wheels will be at the pits.

AIR GAGE INDICATOR.—E. B. CAMP, Camphaven, Orange Rancho, Cal. This invention provides an attachment for tire valves, the device being in the nature generally of a cap to be applied to the ordinary tire valve in lieu of the usual cap, possessing within itself novel indicating means to clearly indicate the air pressure, the means comprising a scale on the exterior of the cap and a movable element in a transparent tube within the cap.

RESILIENT GROUND WHEEL.—W. G. PFEIFER, 185 St. James Place, Brooklyn, N. Y. The invention has particular reference to ground wheels for airplanes or like vehicles. Among the objects is to provide a type of wheel the rim portion of which may be rigid, but provided with a series of flexible arms or spokes which extend laterally from the wheel or in a direction parallel to the axis thereof to a considerable distance from the plane of the wheel rim. Another object is to provide means to vary the flexibility of the arms.

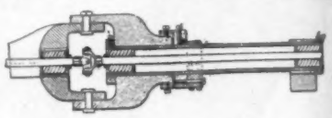
LOCK.—E. C. LAMPSON, Jefferson, Ohio. The invention relates to locks for use in connection with the controls of an automobile whereby the latter may be guarded against operation by an unauthorized person. The lock may be utilized with any or all of the controls, including the clutch pedal, the service brake pedal, the gear shift lever, the emergency brake lever, and the electric system, subject to structural modifications.

TOP SUPPORTING ATTACHMENT FOR WIND SHIELDS.—J. J. GUNLOCKE, 207 St. Helns Ave., Tacoma, Wash. The prime object of the invention is to provide an attachment to prop or support the vehicle top at the front, especially what is known as a one-man top, the attachment having means to detachably secure the same to the lower frame of a wind shield in a manner to prevent interference with the adjustment of the upper wind shield frame, whereby the owner of an automobile may, with facility and at slight cost, provide the support for the top and be enabled to remove the attachment when desired.

SIGNALING DEVICE.—J. BOND, 2336 83d St., Bensonhurst, Brooklyn, N. Y. The object of this invention is to provide a signaling device more especially designed for use, during the day or by night, on automobiles, auto trucks, and other vehicles, and arranged to enable the driver of the vehicle to, display to pedestrians or to following or oncoming vehicles a signal indicating the driver's intention to turn to the right or to the left, to slow up or to stop. The device may be easily attached to open or closed vehicles as now generally constructed.

UMBRELLA HOLDER.—J. STEPHANI, address Harry Werneche, 939 So. Eighth St., Manitowoc, Wis. The invention relates to means for holding an umbrella on a wagon or other vehicle, it has for its general object to provide a holder of a character that will permit of the universal adjustment of the umbrella stick to vary its angular position for affording shelter, together with means to hold the stick in any given adjustment

VEHICLE COUPLING.—R. TINKER, Little York, Ill. The object of the invention is to provide a coupling for vehicles designed to be used on all motor and power vehicles, through which power may be supplied from a motor on one of the



A SECTIONAL FRAGMENTARY VIEW OF THE COUPLING

vehicle parts to tractor wheels on which the coupled vehicle parts are mounted. It is also possible with this construction to steer the vehicle with either the forward or rear tractor wheels.

AUTOMOBILE ENGINE ATTACHMENT.—A. W. SCHENBERGER, Osawatomie, Kans. An object of the invention is to provide an attachment in connection with the commutator, which is in the nature of a spring metal arm including a portion for holding the commutator casing in place, and an extension forming a guide to hold the fan belt on the driving pulley. The fan belt guide may be used as a handle to grasp the attachment to hold it in place when applying it or taking it off.

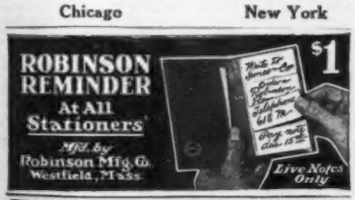
DIRIGIBLE LIGHTING APPARATUS FOR MOTOR VEHICLES.—J. M. CALKINS, 355 Octavia St., Apt. 3, San Francisco, Cal. The invention relates generally to a lighting apparatus which may be readily associated with the vehicle steering mechanism so that the light will be moved to the right or left, upon the turning of the front wheels, with the object of illuminating the roadway in advance of the machine. The invention may be tilted vertically toward and away from the roadway at any desired angle.

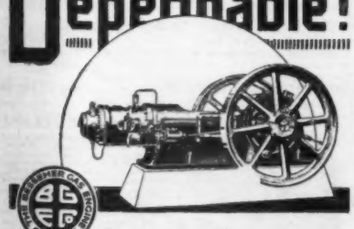
SPEED CONTROLLED GAS CUT-OFF FOR MOTOR VEHICLES.—J. H. CORE, Nashville, Tenn. The invention relates generally to means for checking the movements of motor vehicles the object being the provision of simple uniformly effective means adapted to a valved gas supply pipe whereby to cut off the gas supply, the means directly actuating the valve being in turn controlled as to their operation, and rendered operative and inoperative by other means in turn controlled by the speed of the vehicle itself.

PROTECTOR FOR WIND SHIELDS.—H. W. WEED, 21 4th St., Stamford, Conn. The object of the invention is to provide a protector or hood for wind shields of automobiles and similar vehicles, arranged to protect the wind shield from rain, snow, sleet or other extraneous matter. Another object is to provide a protection which forms a permanent part of the vehicle top and readily folds with the same when the top and protector are not in use.

SPRING WHEEL.—M. S. DE CARMONA, Donoto, Guera 22, Mexico, Mexico. The invention has reference more particularly to spring wheels for motor vehicles. An object is to provide a simple wheel the resilient elements of which are disposed to act at right angles to the plane of the wheel. A further object is to provide a spring wheel which is normally at eased and the deformation of the stressed parts of the wheel during the movement of same under load increases the resiliency of the wheel.

ANTISKID.—O. SWANSON, 1315 Champion St., Denver, Colo. The invention relates to antiskids; used more particularly upon vehicle wheels, provided with tires and intended to keep the wheels from slipping sidewise or backward or forward. The invention has substantially the form of a number of cuffs spaced equi-distant along the body of a pneumatic tire carried by the wheel, some of the cuffs being rigid and others flexible, in order to maintain the tire firmly in position upon the wheel while allowing the tire to yield within proper limit.





The Principles of Camouflage

(Continued from page 168)

decreasing the visibility of airplanes at present as viewed from below is to increase the brightness by the diffuse transmission of direct sunlight on clear days. On overcast days clouds and haze must be depended upon to screen the craft.

Sources of Light

In considering these aspects it is well to recall that the two sources of light are the sun and the sky. Assuming the sun to contribute 80 per cent of the total light which reaches the upper side of a diffusing surface at midday, and assuming the sky to be cloudless and uniform in brightness then the brightness of the horizontal surface will equal 5 RB, where R is the reflection factor of the surface and B is the brightness of the sky. On an overcast day the brightness of the surface would be equal to RB. Now assuming R to be the mean reflection factor of the earth, then the lower side of a horizontal opaque surface suspended in the air would receive light in proportion to RB. If this lower surface were a perfect mirror or a perfectly reflecting and diffusing surface its brightness would equal 5 RB on the sunny day and RB on the overcast day. The surface can never be a perfect reflector so on an overcast day its brightness will be a fraction (less than R) of the brightness B of the sky. Inasmuch as R is a very small value it is seen that low visibility of airplanes as viewed from below can not be attained on an overcast day. It can be approached on a sunny day and even realized by adopting the expedient already mentioned. With this beginning the reader can make further computations.

Seasonal changes present no difficulties for from a practical standpoint only summer and winter need be considered. If the earth is covered with snow an airplane covered completely with white paint would be fairly satisfactory from all viewpoints. The white paint would possess a reflection factor about equal to that of snow thus providing low visibility from above. Inasmuch as the reflection factor of snow is very high, the white lower sides of an airplane would receive a great deal of light and would be of low visibility from below. On clear days when the background was the blue sky the lower sides of the craft should be tinted blue. This of course holds for a similar consideration in preceding paragraphs, but color has not been considered in this discussion because the chief difficulty in achieving low visibility from below lies in obtaining brightnesses of the proper order of magnitude. In winter the barren ground would be of the same color and reflection factor as in summer so it would not be difficult to take this into consideration.

Seaplanes whose backgrounds generally consist of water would be painted of the color and brightness of water with perhaps a slight mottling, as this is always better than solid color.

Invisibility at Night

Aircraft for night use would be treated in the same manner as aircraft for day use if the moonlight is to be considered a dominant factor. This is one of the cases where the judgment must be based on actual experience. It appears that the great enemy of night raiders is the searchlight. If this is true the obvious expedient is to paint the craft a dull jet black. Experiments indicate that it is more difficult to pick up a black craft than a gray or white one and also more difficult to hold it in the beam of the searchlight. This can be readily proved by the use of black, gray and white cards in the beam of an automobile headlight. The white card can be seen in the outskirts of the beam where the gray or black cannot be seen and the gray can be picked up where the black one is invisible. The science of vision accounts for this as it does for many other questions which arise in the consideration of camouflage or low visibility.

Some attempts have been made to apply

the principle of confusibility to airplanes as finally developed for vessels to circumvent the submarine, but the folly of this appears to be evident. Air battles are conducted at terrific speeds and with skilled maneuvering. Triggers are pulled without computations and the whole activity is almost lightning-like. To expect to confuse an opponent as to the course and position of the airplane is folly.

The camouflage of observation balloons has not been developed though experiments were being considered in this direction when the war closed. Inasmuch as they are low altitude craft it appears that they would be best camouflaged for the earth as a background. Their enemies pounce down upon them from the sky so that low visibility from above seems to be the better choice.

In the foregoing it has been aimed to give the reader the general underlying principles of the visibility of airplanes. As stated there is a vast amount of data available upon which the development of low visibility for airplanes could be founded. However, inasmuch as the war closed before a systematic development was achieved practical examples which are founded on definite data are unavailable. Full justice can not be done this subject in a few paragraphs, but it is hoped that there has been presented a broad view of an extensive subject.

The German Art of Make Believe

(Continued from page 169)

and fitted for breadmaking. The cultivation of lupine demands very little care and no fertilizing, while its roots enrich the soil to a very high degree with nitrogen.

Among other economic discoveries is a process for making a cement substitute, worth while noticing. Common building lime is so treated that it has the same quality as cement on hardening in water. The new material has been extensively used in smaller residences, has been found much cheaper than cement, and seems to prove a valuable and cheap substitute for cement.

The eagerness with which Germany has turned to the many substitutes which have been put upon the market has naturally resulted in many disappointments as well as many valueless articles. More than 700 substitute materials have been forbidden sale and use by the Government authorities, and numberless others have been refused licenses.

Taking the substitute materials as a whole, one can say that however valuable they have proved for the time being, they can not in the future make up for the imports of raw stuffs Germany will require, and they can not free Germany from her foreign economic dependency.

The Mystery of the Boomerang

(Continued from page 175)

to sleep it has found its most constant axis of rotation after a preliminary struggle around what I may call, for popular explanation, its irregular or eccentric approximation to a steady axis of rotation.

There remains still to be explained the curve to the left at the end of the outward flight of the boomerang, which immediately precedes the great volplane back to the thrower. This, I think, can easily be accounted for on the principle of swerve, as shown in the case of a spherical object in the air or a curling-stone on the ice.

This well-known principle is that the ball edges away from the side that is revolving toward the point to which it is traveling. On that side the motions of progression and revolution coincide, that is, they are both forward; while on the other side the revolution is backward. With greater forward velocity and equal weight on the forward spinning side, there is consequently more friction on that side; and, as a projectile always seeks the line of least resistance, the boomerang, like the ball, naturally edges over to the side that is spinning backward. It may even be that this is the main function of the

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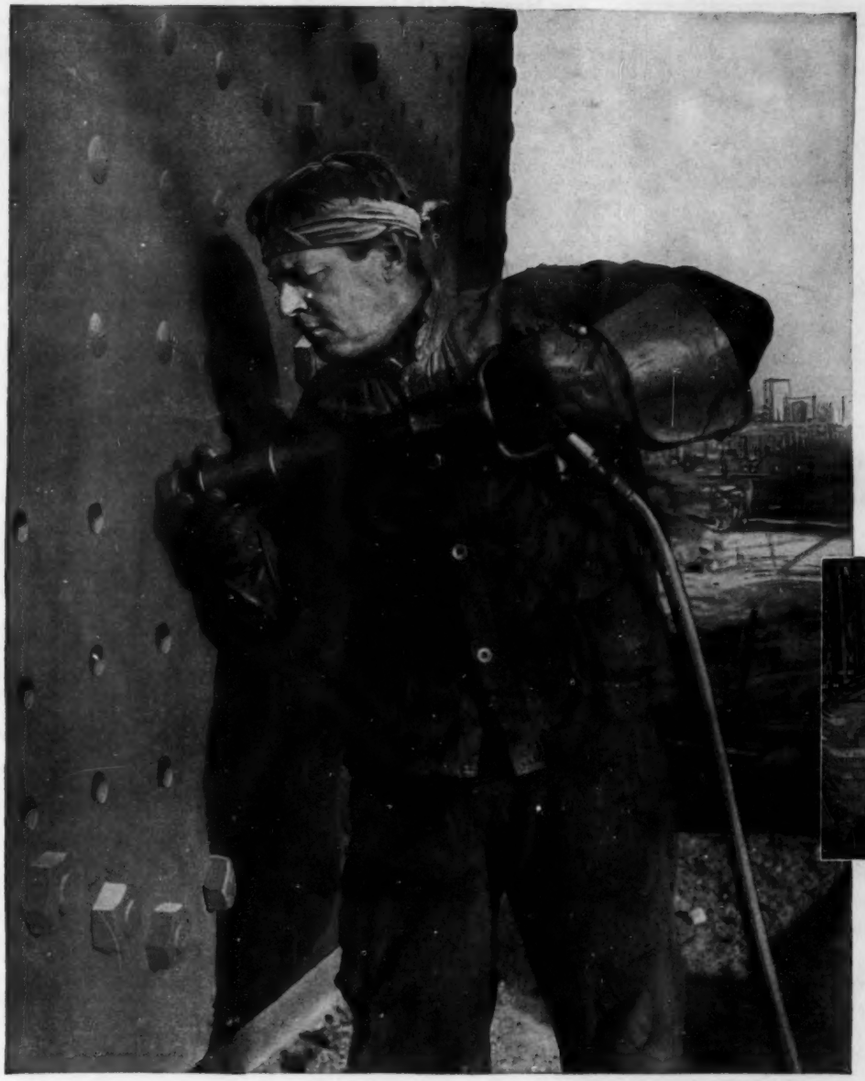


Breaking Shipbuilding Records

From Seattle to Philadelphia, the stutter of thousands of pneumatic riveting machines rends the air. White-hot rivets, under the feverish urge of compressed air, bolt plate to frame. Soon another hull takes the ways and adds to Uncle Sam's ship tonnage.

Trailing serpent-like from the riveting "guns" to the compressors are long, gray lines of United States Pneumatic Hose. Air-tight and kinkless it is, delivering every ounce of air that the pumps register.

In those dark days when the Bridge of Ships was the one vital line of communication between our shores and the Western Front, American shipyards responded with record-breaking launchings.

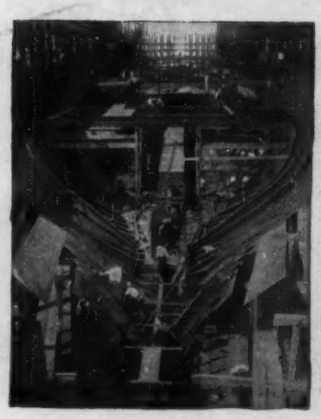
Spirit counted for most. But it will not be denied that United States Pneumatic Hose was a very important factor. U. S. "4810" helped make those riveting records possible.

Light, strong and flexible, it follows the riveter and his bucker-up wherever they go. Dragged over rough places, trod upon by man and horse, run over by cart and truck, it's all in the day's work. "4810" stands all kinds of abuse, without bursting or getting flat.

The United States Rubber Company makes good Rubber Hose for every purpose—air, gas, steam, dredge, fire, garden, etc.

Tell your hose problems to our nearest branch. They will be thoroughly analyzed by specialists and recommendations offered. All without involving the slightest obligation on your part.

Your assurance of superior service is in dealing with the largest rubber manufacturer in the world, whose quality-mark is the well-known U. S. seal. Let that seal guide you in all things pertaining to good rubber goods.



Inserts photographed at Hog Island. Courtesy American International Shipbuilding Corporation. Large picture shows man riveting marine boiler.

United States Rubber Company

Mechanical Goods Division

The Mystery of the Boomerang

(*Continued from page 182*)

angular or raised side of the boomerang; for it stands to reason that this side gets much more friction than the flat side does. And it gets it in practically the same manner as a baseball or any other spinning sphere does, namely, on the forward-spinning side of the "circle" made by the rotating boomerang. This, of course, on account of the simultaneous spin and progress, is never a true circle, but more an approximation to a helical curve in space—or a cycloidal curve while the boomerang remains for an appreciable period in one plane.

There is another factor that enters largely into the alteration of the initial plane of flight of the boomerang. The rounded side is held inward, toward the left side of a right-handed thrower. As I have mentioned, the natural pull of the throw is across the body; and this lays the boomerang over a little out of the vertical plane of rotation. It follows quite naturally that on the upward and forward quarter of the "circle" formed by the rotating boomerang there is more friction than anywhere else—certainly much more than on the lower and flatter side; also the pull of gravitation coincides with this pressure so that the result is strongly apparent.

It would appear quite natural, too, that the boomerang should take the influence of these forces suddenly and markedly, as it does at the end of its outward flight. We are well acquainted with the principle that pace will always overcome spin, so long as there is enough of it. This is shown in the most emphatic way in the flight of a golf ball.

The spin begins to show its effect as the pace dies away. The sliced or pulled ball goes straight for maybe a hundred yards, then begins to swerve sharply. Also, the pitched ball travels straight up to the plate and is a success in proportion to the sharpness of the "break" which it develops when it gets there. So it is in the flight of the boomerang; but in this case, the spin has the added advantage that the flight of the implement is for the moment almost suspended, while the rate of rotation has not been appreciably decreased. It follows naturally, especially when one considers how swiftly gravitation rushes to the aid of spin in this case of deflection, that the boomerang veers swiftly to the left and so starts the long return slide down the bank of air, gliding back to the thrower on its invisible medium just as accurately as though there were a bank of solid ice extending from the highest point of the flight down to the feet of the person who threw the weapon.

Eliminating a Railroad Waste

(*Continued from page 176*)

The high cost of wiping waste and rags brought about by the war has induced American manufacturers to give up the practice of burning these articles after use, and, like M. Grison, to install laundry equipment which will restore these fabrics to service. One such plant has been in operation near Cincinnati for more than a year. The principal units here are a washer, an extractor, and a drying tumbler.

A careful record kept by this company shows that the average net saving has been about $300 per month. This is after charging the project with rent for the space occupied, interest on the original cost, and a proper amount for the steam and hot water used. For each 100 pounds of dirty wipers an average of 10 pounds of washing soda and ½ pound of soap is required. One man operates the laundry.

The experience of this concern is that ordinary waste can be reclaimed seven times, while certain superior grades of rags have gone through the laundering process 75 times. The waste after it comes from the laundry is perfectly dry and fluffy, with about the same high absorbing quality as before it was first used.

An interesting side-line of this laundry is the washing of the men's overalls. This is done, at a profit, under a charge of five cents per piece, which is about one-third the regular laundry charge. This arrangement has proved very satisfactory from several points of view, not the least significant of which is that the psychological effect of universally clean overalls is reflected in a cleaner general appearance of the shop. Incidentally, the ladies of the workmen's families appreciate being relieved of the unpleasant task of laundering overalls.

Isaac Hill Bryant

MR. I. H. BRYANT a First Assistant Examiner, of over twenty years' service in the Patent Office, on February 2d, was struck by an electric train at Highbridge, Md., and instantly killed. He was a native of Tennessee and a graduate of Belbuckle School and Vanderbilt University. Following his graduation he spent about twenty years at teaching and superintending schools at various points in Texas and in 1898 was appointed to the Patent Office. Mr. Bryant possessed a delightful personality and a sterling character and his name adds luster to the long list of able and devoted men who have given the best years of their lives to the service of the Patent Office.

The Current Supplement

EVERYWHERE we go we see multitudes of men of our army and navy wearing insignia of their rank on the sleeves of their coats, but in the overwhelming interest of greater matters it is seldom considered how these thousands of designs are produced, or how they can be all made so exactly alike. Of course they are produced by machinery, examples of which are shown in illustrations in the current issue of the SCIENTIFIC AMERICAN SUPPLEMENT, No. 2251 for February 22d. Much interest has developed over the fossil human remains found in Florida some time ago, and a statement of the facts was given in the SUPPLEMENT last year. A review of further evidence and theories will be found in the current issue in an article entitled, *The Pleistocene Man of Vero, Florida.* A valuable and original paper is that on *The Chemistry of Flavoring Matter*, mention of which will be found elsewhere. *The Camelidae of the New World* describes and illustrates in an unusually complete and attractive manner some of the South American relatives of the camel. *The Manufacture of Charcoal as an Economic Measure* discusses a method for utilizing the present enormous wastes that attend lumber production, especially in the Northwest. It is accompanied by illustrations. Other articles in this issue include *The Trim of Ships, Photographic Copying, On the Essence of Physical Relativity*, and *A Museum as a Laboratory.*

Why Bread Gets "Stale"

WHILE everybody knows empirically what so-called "stale" bread is it has remained for a Dutch scientist, Mr. J. R. Katz, of Amsterdam, to investigate the actual causes of the change from fresh bread to stale bread. As the result of his researches he comes to the conclusion that the phenomenon is not due merely to a loss of moisture, as most people suppose, but depends, on the contrary, almost exclusively upon the temperature; moreover, it is what is called a reversible phenomenon, *i. e.*, under certain conditions stale bread can be restored to the state of fresh bread, recovering the qualities temporarily lost. According to Mr. Katz the starchy components of the bread appear to be entirely responsible for the transformation, the nitrogeneous substances playing no part in the change. The proof that the staleness is not caused merely by loss of moisture is twofold; in the first place, the bread even when kept in a closed jar to avoid too rapid desiccation, is nevertheless stale at the end of 24 hours, and secondly,

other things being equal, the crumb will remain fresh and soft and retain its flavor if the surrounding temperature be kept at sixty to seventy degrees Centigrade (140-158° F.).

Mr. Katz found by direct experiment, that bread taken from the oven and kept for 48 hours remains fresh or grew stale according to the temperature in the following manner:

In all instances if the temperature did not fall below 60° C. (140° F.) it remained perfectly fresh, while at 50° C. (122° F.) it began to get stale; and the lower the temperature the more rapid and the more complete was the change to staleness, reaching its maximum at about 2 below zero C. (28.6° F.) (slightly below freezing point). Most unexpectedly, however, as soon as this point is passed the bread immediately shows a tendency to become fresh once more. At 8° C. below zero (17.6° F.) it is only half stale, while when the temperature of liquid air is reached it is absolutely fresh, though naturally it cannot be said to be edible. The practical conclusion to be drawn from these curious experiments seems to be that bread should be placed in some receptacle, such as a fireless cooker, for example, immediately on being removed from the oven, where it can be kept at the required temperature until required for use.

It seems possible that the problem of workless Sundays for bakers might be solved in this manner.

Syrup from Grapes

DURING the agitation for prohibition in California, one of the really vital problems concerning large sections of the state was what to do with the immense crops of wine grapes if they were not made into wine.

There are large areas of land in California on which little else but these grapes will grow; so the problem was, how to prohibit the manufacture of wine without bringing undue hardship on the people engaged in growing the grapes, as these grapes were considered fit only to be converted into wine.

The Agricultural College of the University of California took up the problem, and has developed in its laboratory a practical method of converting grape juice into excellent syrup—an article so much in demand in these days of sugar conservation.

The University claims that the conversion of grapes into syrup instead of wine will double the value of the grape crop of the state, that the 259,000 tons of wine grapes, now worth $4,000,000, whose market will be cut off by war prohibition in 1919, if made into syrup would be equivalent to 40,000 tons of sugar of a present value of $8,000,000.

At the same time, an independent chemist and grape expert has succeeded in producing a syrup from grapes which is declared to meet all the requirements of a practical, commercial syrup. According to figures which he submits, his method will produce syrup at a slightly less cost than that of the University.

One of the most interesting features of this question is the plan recommended by the University that all grape growers, wineries, and sugar factories coöperate next year in the interest of all these industries. It proposes that the wineries purchase the grapes of the vintage of 1919, and extract and store the estimated 50,000,000 gallons of juice, the larger summer factories to receive the juice, concentrate it, and ship syrup to the canneries for use in 1920.

This can be done, because the University has discovered a simple and inexpensive process of treating the juice which will prevent fermentation for a year if necessary. The bulletin states that this syrup can be used in place of sugar in preserving some fruits, and mixed with sugar for others.

Not only will grape growers and win-

(*Continued on page 188*)

The Design and Construction of Induction Coils

By A. FREDERICK COLLINS

6¼x9¼ inches. Cloth. 272 pages. 150 illustrations. $3.65 postpaid

This work gives in minute details full practical directions for making eight different sizes of coils varying from a small one giving a ½-inch spark to a large one giving 12-inch sparks. The dimensions of each and every part are given and the descriptions are written in language easily comprehended.

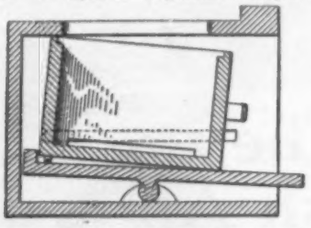
Scientific American Publishing Co.
Woolworth Building New York City

RECENTLY PATENTED INVENTIONS

Of Interest to Farmers

HAY SWEEP.—M. ANDERSON, Hastings, Neb. An object of this invention is to provide a sweep-off mechanism comprising a frame pivotally supported at its upper end by the rake and depending at its lower end between the teeth of the rake, wherein means is provided for varying the angle of the plane of the teeth with respect to the ground, and wherein means is provided for insuring the positive unloading of the sweep when it is moved rearwardly.

BEEHIVE.—E. E. SCHUMAKER, Hilbert, Wis. The invention relates to a bee-hive which comprises a bench housing and a removable brood nest. An object is to provide a simple and



A SECTION THROUGH A BEEHIVE AS INVENTED

efficient hive which can be easily inspected and which will give access to the broods nest at any time without materially interfering with the working of the bees.

CULTIVATOR.—R. C. DOUGAN, Millersburg, Ohio. This invention has for its object to provide a device especially adapted for cultivating corn, wherein means is provided for harrowing the ground upon each side of the row to break up the crust and form a mulch, without disturbing the seed or the growing plants, and adapted to be used until the corn is laid by.

IRRIGATION CHECK.—G. W. RICE, Twin Falls, Idaho. An object of this invention is to provide a movable and adjustable irrigation check, formed with two vertically reciprocating wings operating in conjunction with two cross levers, and a canvas attached to each wing, to fit any irrigation ditch, that will raise the water in the ditch, as is necessary for taking it out of the ditch and on the land, and also provide a free passage over and through the check for weeds and other rubbish.

REVERSIBLE IRRIGATION BOX.—G. W. RICE, Twin Falls, Idaho. This invention relates to a metallic irrigation box for taking water out of a ditch, and controlling the volume as required. The box face has an adjustable wire screen to keep rubbish from stopping it up. By cutting a hole through the ditch bank one may force the wings or face of the box in the bank, and forcing the projection or lower side of the box into the earth in the bottom of the opening. The box is so constructed that it is reversible.

Of General Interest

FOUNTAIN PEN.—E. G. WOODY, 470 Putnam Ave., Brooklyn, N. Y. Among the principal objects which the invention has in view are to provide means for moistening the nibs of a fountain pen, to avoid blotting of the ink at the beginning of the operation of writing, and to simplify the construction. The desired result is accomplished by pressing a button at the upper end of the pen, which forces a small supply of ink under the nibs, and puts them in condition to commence operation.

FOCAL PLANE SHUTTER.—E. C. BASS, 30 W. 59th St., New York, N. Y. The invention relates to photographic cameras, its object is to provide a focal plane shutter arranged to permit of accurately and positively making exposures in rapid succession. Another object is to actuate the shutter from the film feeding mechanism to operate in unison with the latter. The shutter is controlled by the film feeding mechanism so that the exposures are made at the proper time, that is, when the film is at rest.

PORTABLE HOLDER.—G. COHSON, 650 W. 177th St., New York, N. Y. The object of the invention is to provide a portable holder designed for use in the home, hospital or when traveling, and arranged to permit of carrying a number of bottles filled with milk or other liquids together with nipples and other accessories for the needs of a baby or invalid during a journey, to keep the contents of the bottles in proper condition by refrigeration and to allow of conveniently heating a filled bottle prior to feeding the contents to the person.

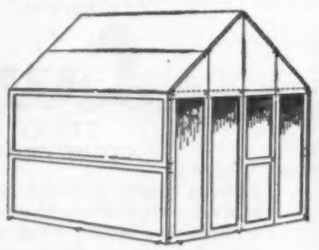
CONSTRUCTION BLOCK JOINT.—P. GLENNIE, 17 Massachusetts Ave., North Andover, Mass. An object of the invention is to provide a simple construction block which is particularly adapted for concrete blocks and which is characterized by the provision of sinuous grooves adapted to be disposed vertically and into which a cement key may be cast which would lock the blocks at the joints so as to relieve the weight of the blocks on the underlying blocks and transmit the weight to the members to which the blocks are joined.

CIGARETTE CASE.—E. OLDENBUSCH, 366-388 Butler St., Brooklyn, N. Y. The general object of the invention is to provide a case which permits of the easy and convenient placing of the cigarettes therein without danger of their being broken, the case being composed of half sections which are hinged together at the bottom so that the case can be completely opened, one section of of the case having seats arranged in a line so that the cigarettes may be held in proper spaced relation.

VEGETABLE GLUE OR ADHESIVE.—C. BERGQUIST, care of F. W. Tunnell & Co., Inc., 15 N. 5th St., Philadelphia, Pa. An object of the invention is to provide an adhesive forming a thick smooth paste which on drying gives a clear film in place of the usual dull opaque flakes. The process of making the starch compound consists in treating hydrolyzed starch or its derivative with formaldehyde and an ammonium compound adapted to form hexamethylene-tetramin, the quantity of which does not exceed 2½ per cent of the quantity of starch by weight.

CHECK BOOK.—B. L. HOLLISTER, Aitken, Minn. An object of the invention is to provide a small, compact check book including a series of pages in which check blanks and record blanks alternate throughout the series, and of which the check blanks alone are detachable, and the record blanks are provided with spaces registering with certain of the spaces on the check blanks, whereby written data in the spaces of the latter may be duplicated, by the use of carbon or transfer paper, in the corresponding spaces of the former.

PORTABLE CAMP.—H. THIESSEN and R. LAGE, 2727 McKinley St., Davenport, Iowa. The invention is especially adapted for the use of automobile and camping parties, being composed of a frame of light material with ends and



A PERSPECTIVE VIEW OF THE CAMP SET UP

side walls and a roof, which are so connected as to form a rigid structure and adapted to be disconnected or collapsed, the sections folding upon each other alternately and in opposite directions for storage and transportation.

DUMMY AERIAL BOMB.—E. V. ESKESON, Perth Amboy, N. J. The invention relates particularly to dummy bombs utilized in the training or instruction of bomb droppers, the object being the provision of a simple construction, whereby to permit of the manufacture of the body of the bomb from plastic material, and distribute the weight so that the center of gravity may be located at the proper point, with means to secure a relatively lighter tail-piece carrying the guide wings, a portion of which means also serves to properly distribute weight.

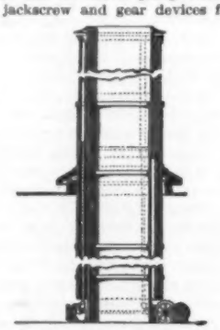
FILM MOUNT.—W. L. SNIDER, 107 Hawthorne St., Hot Springs, Ark. The invention has for its object to provide mechanism especially adapted for mounting X-ray dental films in such manner that they may be easily viewed by transmitted light. The mount comprises a sheet of cardboard having an approximately central opening, said opening having rounded inward extensions of its ends and sides for engaging over the film.

SIPHON CREAM REMOVER.—J. H. COUNTER, Oskaloosa, Iowa. The present invention relates generally to siphon cream removers, and more particularly to a remover of the type described in Patent 1,237,871, granted to the same inventor, upon which the present improvements are based, the object being the provision of a simplified construction, capable of equally effective results, and adapted to obviate certain unnecessarily complicated parts of the construction.

FORM FOR CONCRETE VESSELS.—O. P. KROEGER, El Paso, Texas. The invention relates to concrete forms and more particularly to forms for concrete vessels. An object is to provide a form for concrete vessels, including as one of the important features, a portable outer shell made in sections and adapted to be used again and again in building different vessels.

SKYLIGHT BAR.—S. A. SPENCER, 304 Portland St., Oakland, Cal. One of the principal objects of the invention is to provide an astragal or pane supporting bar, for use in connection with skylight or the like. Another object is to provide means, in the nature of auxiliary gutters, forming a part of, and communicating with, the main gutter for collecting the water of condensation which gathers on the under sides of the panes, and delivering it to the main gutter.

TELESCOPIC SMOKESTACK.—K. LANGER, Baltimore Dry Dock & Ship Building Co., Baltimore, Md. An object of the invention is to provide a telescopic smokestack adapted primarily for use on ocean going vessels, which includes jackscrew and gear devices for raising



A VERTICAL SECTION

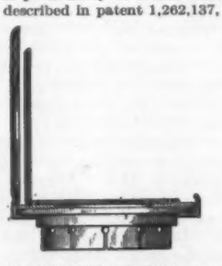
the extensible section, said device being located externally of the stack so as to be protected from the stack gases, but also so located as to be protected from the weather. Another object is to provide a housing for the jackscrew and gear devices.

REGISTER.—C. G. SURBER, 104 N. 8th Street, Richmond, Va. One of the principal objects of the invention is to provide a pocket register which will be of particular use to traveling salesmen. Another object is to provide a register having a series of disks adapted to register the total amount of expenses, and having a second series of disks adapted to indicate the amount of expenses during any particular space of time, means being provided whereby the second series of disks may be set at zero, without affecting the first series.

SEWER CONSTRUCTION.—W. B. GRAY, care of M. J. Bannon, 836 So. 13th Street, Louisville, Ky. The invention has for its object to provide a conduit of molded blocks, arranged in such manner as to provide a maximum of resistance to stress in any direction, wherein an inner and an outer series of blocks is provided, the members of each series being locked against displacement in any direction, and being locked to the members of the other series against displacement in any direction.

THERMOSTATIC FIRE ALARM.—H. H. CAMP, Spencer, W. Va. The invention relates more particularly to a thermostatic member for use in connection with electrical alarms of fire and other types, the object being the provision of a thermostatic circuit making alarm member which will be at once simple in construction and strong and durable in use.

LENS SHIELDING ATTACHMENT FOR CAMERAS.—B. M. TAKAHASHI, Harlowton, Mont. The invention relates generally to cameras but particularly to a lens shielding attachment, described in patent 1,262,137, granted



SECTIONAL VIEW WITH SHIELDING DISK AND FILTER COVER OPEN

to the inventor. The prime object of the present invention being to provide a lens shield by means of which a lens may be conventiently shielded either with or without a ray filter, and the latter conveniently carried and carefully protected in use.

CARTON.—J. E. LOWY, 15 Post Ave., New York, N. Y. This invention relates to a carton or collapsible container for breakfast foods, grains or the like, the object is to provide a carton formed with a dispensing opening in its top so that the contents can be poured out, there being a foldable flap or cover to normally close the opening and keep the contents in a sanitary condition.

Hardware and Tools

CHECK HINGE.—E. FRANCKAERTS, 511 Webster St., San Francisco, Cal. This invention has for its object to provide a hinge which will automatically close the door when it has been opened and released, and wherein checking mechanism is provided for cushioning the closing movement of the door. The hinge consists of a casing composed of a section forming a chamber for liquid, having connected with the lower end thereof a section forming a chamber for holding the spring which closes the door, the sections having threaded engagement.

Machines and Mechanical Devices

PRINTING PRESS.—A. J. SMITH, 303 W. 122d St., Apt. 3, New York, N. Y. An object of the invention is to provide a printing press whereby static electricity incident to the operation of a press is dispelled or neutralized and an equal drying of the ink is obtained without danger of igniting the paper. Another object is to provide a gas burner having a supply valve controlled by electromagnetic means controlled by the stopping and starting device of the printing press, to automatically turn on and shut off the gas supply, when the press is started and stopped.

STONE CUTTING MACHINE.—O. W. KRUM, Maple Ave., Springfield Gardens, Queens, N. Y. The object of the invention is to provide a machine for cutting granite or other stone to ornament the face thereof, according to a predetermined design without requiring undue physical exertion on the part of the operator. To accomplish this results use is made of a row of chisels actuated simultaneously by power, longitudinal feeding means for simultaneously feeding the chisels bodily in the direction of the length of the row of chisels, and feeding means for simultaneously feeding the chisels up or down.

OFFSET WEB CLEANER FOR PRINTING PRESS.—J. M. THIER, 1022 Jackson Ave., Bronx, N. Y. Among the principal objects of the invention are to extend the useful life of an offset web, to prevent the accumulation of smutting or blurring substances on the web, to smooth the web before introducing the same to the packing roller, to provide apparatus for the above stated purposes which are interchangeable, and to concentrate the accumulated debris collected from the web.

VENDING MACHINE.—S. TENNER, address Leon Tenner, 537 W. Congress St., Savannah, Ga. The invention relates particularly to machines for vending candies, chewing gum, and the like, one of the main objects is to provide such a machine in a compact form, whereby it will occupy but little spaces as, for instance, upon the back of a theatre seat. Another object is to provide means for preventing the delivery of merchandise contained in the machine by spurious substitutes for coin for which the machine is designed, and to prevent the insertion of a coin while the merchandise is out of normal position.

VULCANIZING PRESS.—P. and B. DE MATTIA, Garfield, N. J. Among the principal objects which the invention has in view are to provide heat-retaining means for surrounding molds used in vulcanizing rubber articles, to provide a press with a chamber for preventing the radiation of heat from the edges of the molds and articles contained therein, to provide means for applying an expansive heating medium to the molds, and to provide a simple, durable and efficient cabinet and full-open-door therefor.

SYLLABIC TYPEWRITER.—L. TIOLI, Rome, Italy. This invention refers to typewriters known as "syllabic typewriters" which permit of contemporaneously printing several letters. One of the objects is to provide a typewriter of this class which will permit of printing at a stroke two, three, or even more letters or signs arranged in any way whatever, without preventing the use of the single keys in the same manner as in the ordinary typewriters, viz., for printing a letter, or sign, at each stroke.

SILENCER FOR VALVES.—M. C. DART, 323 E. 155th St., New York, N. Y. Among the principal objects which the invention has in view are to compensate for the expansion and contraction of the metal parts of direct acting valves, to avoid varying the action of the valve mechanism, find to simplify the construction of the silencer. The silencer has resilient bifurcated members the ends whereof are flared, the members are integrally connected by a reduced section in the form of an open bore extended through the rear or joined end of the silencer.

ORTHOPEDIC TABLE.—S. TASCARELLA, 65 George St., Brooklyn, N. Y. An object of the invention is to provide a table wherein the feet and leg stretching supporting bars may be not only swung in a horizontal plane, but may be adjusted toward and from each other in the same plane. A further object is to provide an improved tightening construction for locking the parts in any desired adjusted position, and to provide a temporary heel support, which may be quickly removed.

Syrup from Grapes

(Continued from page 186)

eries be benefited by the greatly increased value which the syrup industry promises to give to grapes, but if the sugar factories will convert the juice into syrup, which they are well equipped to do, they will be kept running several months longer each year. Hitherto, the sugar beet "campaign", as the sugar making season is called, has only lasted about three months so this plan would seem to be a distinct advantage to the factories.

The State University is a high and conservative authority, so it seems very nearly certain that the solution of this vexed problem is at hand, and that it is to be solved in a way more satisfactory than we had dared to hope.

The Economic Effect of the Loss of Alsace-Lorraine

THE economic loss to Germany involved in the cession of Alsace-Lorraine is discussed by Dr. Felix Pinner, the financial editor of the *Berliner Tageblatt*, in a recent issue of that journal. The author concedes that the acceptance of the terms of President Wilson has given an international aspect to the Alsace-Lorraine question and suggests that it might be worth examining the economic value of that territory to Germany. He points out that Alsace-Lorraine is not only one of the most highly developed manufacturing parts of the Empire, but also, what is more important, one of the chief sources of raw materials with which Germany is not any too well supplied.

The mere loss of a manufacturing industry, no matter how highly developed, is far less serious than the loss of a supply of raw materials. Manufacturing industries based largely on foreign raw materials may be easily transplanted; the productive forces, the capital, the enterprising spirit, the technical training and commercial connections involved are comparatively mobile and may be restored after overcoming a certain amount of disturbance during the period of transition. The loss of raw materials, on the other hand, is final and irreplaceable. The mere mention of ore, potash, and petroleum is sufficient to indicate the significance of Alsace-Lorraine as regards to raw materials.

As to petroleum, Alsace produced prior to the war 42 per cent of the total amount of 120,000 tons of crude oil produced in Germany, and while the yield has increased somewhat lately, it is still of slight importance as compared with the total German consumption of petroleum. The potash deposits are of far greater importance, both from an economic and politico-economic standpoint. It is true that the potash deposits in the other parts of Germany are more than sufficient for domestic consumption and export. But the loss of the Alsatian deposits (about 10 mines belonging mostly to the German potash syndicate) will deprive Germany of the world monopoly which it has heretofore enjoyed and take away from it one of the few weapons of economic defense.

While the statements in the Allied press to the effect that the Alsatian deposits will be sufficient to provide potash for all countries outside of Germany may be exaggerated, the fact remains that the loss of these deposits is of extreme importance. The potash monopoly, the writer asserts, enabled Germany not only to fix the prices for foreign markets above those for domestic consumption, but also to offer an important product in exchange for raw materials produced by countries depending on German potash. The loss of the Alsatian deposits will, therefore, put an end to the independent export policy of Germany as regards potash and will force it either to cut prices or enter an agreement with the new owners of the Alsatian deposits.

The most severe blow will be the loss of the iron-ore deposits. It is safe to state that without the acquisition of the Lorraine iron-ore deposits in 1871 the astonishing development of the German iron and steel industry would be unthinkable. From a few million tons the German iron and steel production increased within the two decades preceding the outbreak of the war to 19,000,000 tons, far outdistancing the British production and being 10,000,000 tons behind the American production. The importance of the Lorraine deposits is not indicated by the iron and steel production of Alsace-Lorraine (2,286,354 tons), but by the fact that the entire iron and steel industry of the western part of Germany, particularly in the Rhenish Westphalia and Saar districts, depended to a large extent on Lorraine minette. The Lorraine and Luxemburg mines (the Luxemburg mining industry being closely connected with that of Lorraine and the separation of Lorraine will probably mean the loss of Luxemburg as a member of the German Customs Union) supplied in 1913, 28,500,000 tons of iron ore out of a total of 35,000,000 tons for the whole of Germany, or 77 per cent on the basis of metallic content. The loss of Lorraine would, therefore, mean that for a large part of its iron-ore needs Germany would depend on foreign countries, while in 1913 it imported foreign ore from Sweden, Spain, Russia, and, perhaps, even from France, but the raw material basis of its industry will be narrowed to such an extent as to endanger its maintenance and further development.

In considering the Alsace-Lorraine side of the question, Dr. Pinner points out that the restoration of that territory to France does not necessarily mean the transfer of Germany's position in the iron and steel industry to that country. It is claimed by the writer that France has neither the organizing ability for large-scale industry nor the fuel supply required to maintain an extensive iron and steel industry. He cites the backward state of development of the De Wendel holdings in Lorraine, recently confiscated by Germany, as proof of the lack of enterprise on the part of the French holders of ore deposits. He also states that in spite of the fact that the French portion of the minette deposits was larger than that involved in the loss of Lorraine in 1871, the iron and steel industry of French Lorraine could not stand in comparison with that of German Lorraine. Only a small part of the ore mined at Briey and Longwy was used in France, and the remainder was exported in a raw state. The writer admits that this was not due entirely to the lack of enterprise on the part of the French industry, but partly to the lack of coke, and calls attention to the arrangement in effect before the war by which German coke was exchanged for French ore. The transfer of the Lorraine iron industry to France will still further increase the French demand for coke, and although some French writers maintain that the requisite supply might be obtained from Great Britain, Dr. Pinner points out that it will not be to the advantage of that country to further the development of a rival industry in Lorraine, even if it should belong to France.

Airplanes and Seaplanes of Our Navy in Wartime

THE activity of airplanes and seaplanes used by the United States Navy during the war for overcoming the submarine menace is one of the most interesting chapters of history about which, for "tactical reasons," little has been published to date. Now that the war has been won, however, naval officers are satisfying the wishes of interested organizations by describing and illustrating just what has been done to make America's participation in the war so effective.

At the annual meeting of the Society of Automotive Engineers, in progress in New York, Commander H. C. Richardson, U. S. N., presented a highly instructive paper on the design and equipment of Navy airplanes and seaplanes. Many members of the Automotive Engineers Society have been employed in this line

(Continued on page 190)

Airplanes and Seaplanes of Our Navy in Wartime

(Continued from page 188)

of work during the war, and it is to be expected that the lessons learned will be utilized by them in the construction of aircraft to be used during peace times as well.

Commander Richardson states that the comparative inactivity of the German and Austrian fleets practically reduced the action of our seaplanes to coöperation with the Allied fleets. Coast stations were established in Italy, France, Great Britain, and the United States, and were used as bases of operation from shore.

Since some of these bases were subject to attack by enemy planes, the Navy had to have also land machines for the protection of such establishments. In his paper Commander Richardson gave a description of the various types of airplanes and seaplanes as developed during the course of the war. Every effort was made to produce suitable seaplanes, to do effective submarine patrol and convoy work. The two types of seaplanes used most exclusively were the H S-2, a single-motored plane, and the H-16, which is a copy of the English seaplane of the same type. The 5-F-L type was completed too late to see active service. No attempts were made by the Navy to develop land machines, the regular Army planes being adopted. Among the latter were the Handley-Page, the Italian Caproni, and the DeHaviland-Four and the DeHaviland-Nine. For training of pilots the Curtis N-9 was in favor, equipped with the Curtiss OXX 100 horse-power engine. This is a biplane with a single center float and wing tip balancing floats. The Curtiss F boat also was used for instruction.

The Commander explained that while in general there was no great difference in the design of land machines and seaplanes, the weight of the latter was necessarily greater and required a different landing gear and apparatus enabling the seaplane to leave the water and take to the air. A number of charts were shown to illustrate the performance of various planes taking into account the lifting capacity, speed through the air, resistance to penetration of air, and the power required for traveling at a speed from 50 to 100 miles per hour. Details of air propeller design were also discussed. With a Liberty engine developing 380 horse-power at 1,600 revolutions per minute, a speed of 80 miles per hour was attained.

Considerable development work was done to determine the most advantageous form of float. Tests were made in the model basin at Washington, using models one-twelfth the normal size. When the tests were repeated with full-sized floats, the results were found to check accurately.

The Commander advocated the geared-down propeller arranged to turn at 60 per cent of the speed of the engine. This would allow the use of a 13-foot diameter propeller instead of the 9-foot, and would raise its efficiency from 69 per cent to 73 per cent.

The H S-1 is capable of carrying a load of 6,500 pounds at full speed. The H-16 is a twin-engine seaplane. It carries a pilot, an observer and a wireless operator, a number of guns, and four bombs. The F-5 is 10 per cent larger than the H-16. More recently a new type, the N C-1, with three large engines, has been perfected. This is a compromise between a hydroplane and a flying boat, and is adapated for carrying a large caliber non-recoil gun at the bow. A number of this type are being built at present.

The Commander is of the opinion that the future will see much larger seaplanes. He says the structural design of aeronautical engineering is now well in hand, and the use of wind tunnel experiments and full-sized experiments have brought also the aero-dynamic engineering features to a satisfactory state of perfection, so that the performance of new designs can now be predicted with a reasonable degree of accuracy, even before construction has begun.

Notes and Queries.

Kindly keep your queries on separate sheets of paper when corresponding about such matters as patents, subscriptions, books, etc. This will greatly facilitate answering your questions, as in many cases they have to be referred to experts. The full name and address should be given on every sheet. No attention will be paid to unsigned queries. Full hints to correspondents are printed from time to time and will be mailed on request.

(14299) J. A. F. asks: About a year ago I saw mentioned in the SCIENTIFIC AMERICAN where a man had invented a thermo-phone, that was of value for persons hard of hearing, and that the sound reproducing element was a small wire, incased in a small cartridge like case which was placed in the ear. Can you tell me if this invention was a success, if so, will you please furnish me the address of the manufacturer or of the inventor. A. We have no further information of the employment of the Thermophone for assisting the deaf to hear. It is a most delicate instrument. The source of the sound is a thin platinum strip only about twenty-five tenmillionths of an inch thick. The air surrounding this strip is heated or cooled by the increase or decrease of heat in the platinum strip. If this air is retained in the box in which the strip is contained, the expansions and contractions of the air will be heard as a sound. The electric current in the strip is varied by the vibrations of the microphone transmitter. It would seem to be too delicate for rough use as a telephone. The instrument is described in the SCIENTIFIC AMERICAN, Vol. 113, No. 4, dated July 24th, 1915.

(14300) G. E. G. asks: Which has produced the higher degree of temperature, an electric furnace or an oxy-acetelyne blow torch? A. The oxy-acetylene flame is usually set at about 6,000 degrees Fahr., and the electric arc at 6,300-7,000 degrees Fahr.

(14301) J. D. K. asks: Is the decrease of resistance in a carbon sheath due to the fact that pressure causes better contact between surfaces of carbon blocks, or is it thought to depend also upon some internal change? How great a variation of resistance can be produced? What other substances besides carbon are or can be used, and in particular, is there any substance which exhibits this effect when used not in numerous blocks, but as one solid piece? Can you refer me to any discussion of these phenomena, either in SCIENTIFIC AMERICAN or elsewhere? A. The carbon resistance units consisting of many thin plates act simply by pressure, which brings more surface into contact and therefore reduces the resistance. There is no internal change. We do not know the rate of change with pressure. It would be found for any particular rheostat, since the size of plates and their roughness or smoothness would be involved in the determination. We do not know that any other material is used in this way. Metals are too hard to yield to pressure, and non-conductors are out of the question. We do not know any articles on the subject.

(14302) G. R. T. asks: We have been studying about the pressure of water, and are anxious to know the variance of pressures at midocean; that is, the difference in pressure from the top to the bottom. We are also wondering what became of the "Titanic." Is it probably intact in the spot to which it sunk, or has it been crushed to pieces by the pressure? A. The pressure in fresh water increases one atmosphere, usually called 15 pounds, but more accurately 14.7 pounds per square inch for each 34 feet from the surface down to the bottom for any depth. Sea water is denser, and so heavier, than fresh water. Its average density is 1.026, fresh water being unity. Hence if you divide 34 feet by 1.026, you will have the thickness of the layer of sea water which will cause an increase of one atmosphere of pressure. It is 33—feet. Since water is nearly incompressible the density does not increase very much until a very great depth is reached. At the depth of six miles, or at the bottom of the deepest places known, the density is only about a fifth greater than at the surface, and the thickness of the layer which gives a pressure of one atmosphere is about 28 feet. The pressure at this depth, 6 miles, is about 1,000 atmospheres. As to the "Titanic," she went swiftly to the bottom and struck with a high velocity. Her compartments which contained air collapsed before she had sunk to any great depth, since her plates were not thick. When all her compartments were filled with water she sank like the heavy mass of iron that she was.

74th ANNUAL REPORT

NEW YORK LIFE INSURANCE COMPANY

346 Broadway (Organized under the Laws of the State of New York) **New York, N. Y.**

To the Policy-holders and the Public:

Any intelligent man knowing that he must immediately go to war would take any life insurance policy, for almost any amount offered by any responsible company at any reasonable price.

It gives us all something of a shock to realize that the deaths in our army during this unprecedented war just closing have recently been surpassed many times over by the epidemic deaths in everyday life.

Influenza, we are told, up to January 1, 1919, had already killed as many young and vigorous persons in the world generally as were killed by bullets and disease in four and a half years of the war.

The wisdom of an adequate surplus in life insurance is now demonstrated. The folly of New York State in imposing a severe limitation on surplus—against which this Company especially protested in 1906 and since—is also demonstrated.

Through a period of years the mortality of all soundly conducted companies, in spite of influenza and other unforseen calamities, will in all likelihood come well within the tables; but we now understand that incidents can arise through which mortality may temporarily exceed the provisions of very conservative assumptions. It is comforting to know that neither war nor influenza can make any material difference to you as a member of this Company, because as against such startling incidents this Company long since made abundant provision.

From this there are two fair deductions:

First—INSURE—there are just as many and just as sound reasons for insuring your life during days of peace as there are for insuring during times of war.

Second—insure in companies that have aimed above all things to achieve safety. In these days SAFETY sounds better than CHEAPNESS.

Our mortality up to the outbreak of influenza promised to be, in 1918, about 61% of the mortality provided for in the premiums; it was actually 95% of the expected; If this epidemic persists during 1919 your so-called dividends may be reduced in 1920; they remain substantially unchanged in 1919.

New Business of the year, chiefly from the United States and Canada		$340,000,000
The largest new business in the Company's history.		
Received in life insurance premiums		110,000,000
Paid policy-holders:		
Death claims	$35,000,000	
To living policy-holders	62,000,000	97,000,000
We bought so many Liberty Bonds during the year that we were obliged to borrow from the New York banks.		
Our statement shows, on that account, Bills Payable		22,800,000
December 31, 1918, we owned at par Liberty Bonds aggregating	70,000,000	
Bonds of the Allied countries, issued since the war began	30,000,000	
Total war bonds owned		$100,000,000

The Balance Sheet follows. DARWIN P. KINGSLEY, *President.*

Balance Sheet, January 1, 1919

ASSETS

Real Estate	$13,449,600.00
Loans on Mortgages	166,053,804.71
Loans on Policies	155,114,802.36
Loans on Collateral	718,550.00
Liberty Bonds	69,791,491.96
Bonds of the Allied Countries issued since the war began	30,968,201.77
Other Bonds and Stock	508,957,595.13
Cash	21,242,580.17
Uncollected and Deferred Premiums	13,647,771.41
Interest and Rents due and accrued	15,105,402.62
Premiums reported to War Risk Insurance Bureau under Soldiers' and Sailors' Civil Relief Act	15,344.02
War Savings and Thrift Stamps	22,140.71
Total	$995,087,284.86

LIABILITIES

Policy Reserve	$756,695,852.00
Other Policy Liabilities	29,571,149.56
Premiums, Interest and Rentals prepaid	4,515,533.09
Commissions, Salaries, etc	3,876,245.98
Borrowed Money and Accrued Interest thereon	22,863,879.44
Dividends payable in 1919	32,637,614.13
Reserve for deferred Dividends	100,893,328.00
Reserves for other purposes	44,033,682.66
Total	$995,087,284.86

INCOME, 1918

Premiums:		
On New Policies	$13,971,187.19	
On Renewed Policies	91,806,610.15	
Annuities, etc	4,360,997.80	$110,138,795.14
Interest and Rents		$41,500,876.98
Money borrowed to increase Company's subscription to Fourth Liberty Loan		24,000,000.00
Other Income		3,246,707.28
Total		$178,886,379.40

DISBURSEMENTS, 1918

Payments to Policy-holders:		
Death Losses	$35,070,157.61	
To Living Policy-holders	62,629,698.59	$97,699,856.20
Paid to Beneficiaries under instalment contracts		863,872.00
Paid to Agents and for Agency Expenses, Medical Fees, etc.		12,896,633.22
Taxes, Licenses and Insurance Depts., Fees		2,255,320.50
Borrowed Money repaid		1,320,000.00
Other Disbursements, including Real Estate Expenses and Taxes		7,664,525.08
Added to Ledger Assets		56,186,172.40
Total		$178,886,379.40

Policies in force January 1, 1919 1,360,433 ∴ Insurance in force January 1, 1919 $2,838,829,802

NEW BOOKS, ETC.

FOUR DIMENSIONAL VISTAS. By Claude Bragdon. New York: Alfred A. Knopf. 8vo.; 134 pp. Price, $1.25.

In his latest work, this indefatigable student of the fourth dimension and higher space concepts gives the reader, without resorting to mathematics, some interesting glimpses of these elusive ideas, and of the revolutionary knowledge they seem to foreshadow. The latter part of the work leans toward oriental philosophy and seeks to justify its beliefs by the light of four-dimensional speculations.

SIMPLIFIED NAVIGATION FOR SHIPS AND AIRCRAFT. A Text Book Based upon the Saint Hilaire Method. By Chas. Lane Poor, Professor of Celestial Mechanics, Columbia University. New York: The Century Company, 1918. 12mo.; 140 pp.; illustrated; 5 fold. charts. Price, $1.50.

The principles that form the basis of modern navigation are here set forth, shorn as far as possible of complicated language and formulas. The fundamental Sumner method, combined with the reduction methods named after their originator, Admiral St. Hilaire, has the advantage of yielding consistent results under all conditions, and is fully expounded. Aerial navigation calls for less accuracy, but greater simplicity and speed in working a sight; the final chapter is especially framed to meet aerial needs, and the work offers valuable assistance to navigators in training whether for water or air work.

HAND BOOK OF SHIP CALCULATIONS, CONSTRUCTION AND OPERATION. By Charles H. Hughes, Naval Architect and Engineer. New York and London: D. Appleton and Company, 1918. 8vo.; 765 pp.; illustrated. Price, $5 net.

This handy work assembles between its two covers a vast fund of practical data such as is needed by those engaged in the designing, building and operating of ships. The student, ship owners and office men, underwriters and brokers may also turn to it with assurance. Its facts and tables deal with the materials and their strength; constructional, machine and launching calculations; heating, ventilation, refrigeration, drainage, plumbing and fire extinguishing systems; general equipment, and the operation of ship and machinery. Geared turbines, Diesel engines and oil fuel are fully treated, and the latest marine practice is given. Much space is devoted to the loading and stowing of cargoes and the stowage sizes of material.

THE AMERICAN BOYS' BOOK OF SIGNS, SIGNALS AND SYMBOLS. By Dan Beard. Philadelphia and London: J. B. Lippincott Company, 1918. 8vo.; 250 pp.; 363 illustrations. Price, $2 net.

Dan Beard, founder of the first Boy Scouts society, needs no introduction to the American boy. In this, the latest volume of the Woodcraft Series, he has called upon his knowledge of ideographs and of scouts', trappers', gypsies' and Indian signs, symbols and signals, with the result that the book will be eagerly sought by our younger lovers of the open-air life. Such signs constitute a sort of international language, easily understood by all, and of distinct usefulness. The work includes steamer toot talk, animal spoor, weather signals, and the railway lantern code.

THE DRESS YOU WEAR AND HOW TO MAKE IT. By Mary Jane Rhoe. New York and London: G. P. Putnam's Sons, 1918. 12mo.; 186 pp.; illustrated. Price, $1.50 net.

Dress is an art, dressmaking a science. The author of this handbook for women is a qualified teacher of that science, and has been at pains to test each of its lessons in class. The business woman and the housewife of moderate income will welcome the fund of suggestion combined with the most practical directions for the selection and working up of material into tasteful and durable garments. It helps the home dressmaker to reconcile fashion and individuality, and solves many of her problems.

PUTNAM'S AUTOMOBILE HANDBOOK. The Care and Management of the Modern Motor Car. By H. Clifford Brokaw and Charles A. Starr. New York and London: G. P. Putnam's Sons, 1918. 8vo.; 361 pp.; illustrated. Price, $1.90 net.

By personal contact with thousands of men learning to drive cars, the authors have kept in close touch with the questions that arise in the average mind and the difficulties that confront it. So that their handbook, written for the benefit of non-technical men, demonstrates the authors' ability to make crooked ways straight and to lead their pupils on to eventual mastery of the engine and car. Much of the material is assembled from articles that appeared in the automobile sections of New York newspapers, and that were the subject of favorable comment at the time. The beginner is taught to use his brain systematically, yet with initiative; to know the conditions necessary to start a gas engine, to keep it running, and to avoid or minimize trouble on the road.

SECRETS OF SUCCESS IN POULTRY CULTURE. By Hugh M. Wallace. Cincinnati: The Standard Publishing Company, 1918. 12mo.; 198 pp.; illustrated. Price, $1.50.

It is time that people realized that poultry raising is a business, and must be conducted upon business principles if it is to be a success. A right start, a good understanding of the hen and the incubator, and a knowledge of insect pests, diseases, and their antidotes and remedies, are absolutely necessary. A very complete working equipment, mental and material, is outlined in this handbook, written by an experienced and successful poultryman.

THE TYPIST. By J. E. Fuller. Cincinnati: The Phonographic Institute Company, 1918. 4to.; 142 pp.; illustrated. Price, $1.25.

This is, first and foremost, a graded course in the proper fingering and efficient manipulation of the typewriter; it is well adapted either to school use or for home study. The instructions are based on standard shift-key machine practice, and include selections of material suitable for practice, and for acquiring proficiency in the use of the typewriter for commercial, professional and private uses.

FORCED MOVEMENTS, TROPISMS, AND ANIMAL CONDUCT. By Jacques Loeb, M.D., Ph.D., Sc.D. Philadelphia and London: J. B. Lippincott Company, 1918. 8vo.; 209 pp.; illustrated. Price, $2.50 net.

What bids fair to be a most interesting library is the new series of monographs on experimental biology of which this is the first volume. Biology, passing from the descriptive and speculative stage, is adopting the specialized treatment of the exact sciences: this monograph, discarding the romantic treatment for quantitative methods, leads up to the tropism theory proposed by the writer 30 years ago and sustained by more recent experiments and experimenters. The work is a good introduction to this theory and clears the way for further quantitative investigations

PRACTICAL FLYING. Complete Course of Flying Instruction. By Flight Commander W. G. McMinnies, R.N. With introduction by Major-General W. S. Brancker, C.M.G., Comptroller General of Equipment of the Royal Air Force. New York: George H. Doran Company, 1918. 8vo.; 260 pp.; illustrated. Price, $1.50 net.

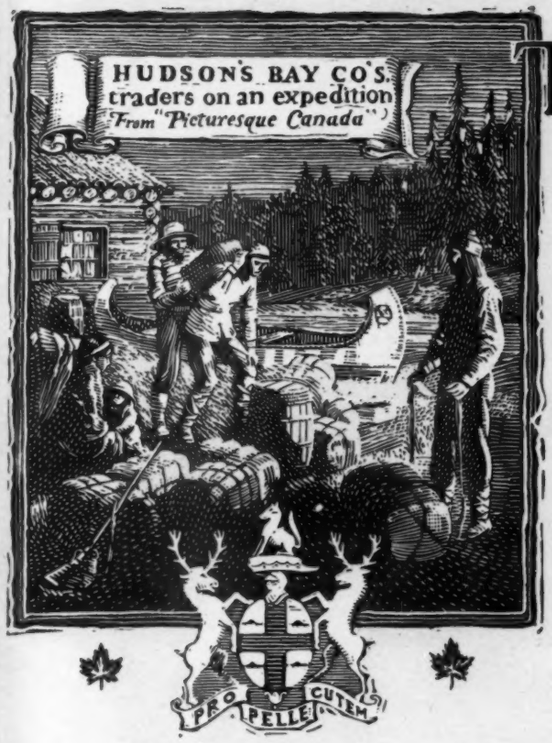
The methods of tuition recently adopted by the British flying services are here revealed, from elementary groundwork to acrobatics, by men who speak with the voice of knowledge and authority. History, theory, and personal reminiscence are left for other writers; here are only the practical instructions by means of which city men and schoolboys, forsaking their desks, were in a few weeks meeting the enemy's crack flyers on equal terms, and giving a remarkably good account of themselves. Lieutenant Ford's illustrations show a mastery of the subject from the instructional point of view, and there is no reason why those training for commercial flying should not be helped by the work as the military learner has been.

THE CANTONMENT MANUAL. By Lieut.-Col. W. G. Kilner, U. S. A. and Capt. A. J. MacElroy, U. S. A. New York; D. Appleton and Company, 1918. 16mo.; 322 pp.; illustrated. Price, $1 net.

The authors give us a comprehensive view of the whole field of military training, sketch and explain the duties of the soldier, and point the way to the winning of a commission. The instructions are crisp as a sergeant's commands; there are first aid suggestions, a section on military French, and an appendix of definitions, forms, insignia, and bugle calls. It is a little book of indisputable merit and helpfulness

SAFETY IN WOODWORKING. New York (13 Park Row): National Workmen's Compensation Bureau, 1918. 8vo.; illustrated. Price, $1.10.

Safety engineers and technical experts, and users and manufacturers of woodworking machinery, have cooperated with the Bureau in making this collection of standards, illustrations and explanatory notes a treasury of information for employers and employees. Being bound in loose-leaf form, any matter becoming obsolete may readily be withdrawn, and new pages substituted. The illustrations of guards are from photographs of devices in actual service; these devices are not confined in their application to the woodworking industry, and the book's utility extends to most industrial establishments.



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In the hour of peril when the French motor car factories were engaged in war work, France, the birthplace of the modern motor car, turned to America for help to supply her great army staff with means of reliable transportation. France knew what she wanted—reliability, endurance, speed and ease of riding.

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